Lower Banister River, Winn Creek, and Terrible Creek TMDL Implementation Plan

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EXECUTIVE SUMMARY

Monitoring performed by the Commonwealth of Virginia identified stream segments within the Banister River and Winn Creek watersheds that did not meet the *Escherichia coli* (*E. coli*) standard and therefore did not protect the recreation beneficial use. Total Maximum Daily Loads (TMDLs) were developed and approved for these impaired segments in 2013. These TMDLs developed bacteria reductions necessary to meet the *E. coli* water quality standard. The goal of the Lower Banister River, Winn Creek, and Terrible Creek TMDL Implementation Plan (IP) is to restore water quality within the Banister River and associated tributaries, to achieve full supporting status for the impaired segments, and to de-list the impaired segments from the Virginia 303(d) List of Impaired Waters for bacteria impairments.

State and Federal Requirements

The Virginia Water Quality Monitoring, Information, and Restoration Act (WQMIRA) directs Virginia Department of Environmental Quality (VADEQ) to "develop and implement a plan to achieve fully supporting status for impaired waters." To meet the requirements of WQMIRA, an IP must include the date of expected achievement of water quality objectives, measureable goals, corrective actions, and costs, benefits, and environmental impact of addressing the impairment. The federal requirements outline the minimum elements of an approvable IP. These include implementation actions and management measures, a timeline for implementation, legal or regulatory controls, time required to attain the water quality standard, and a monitoring plan and milestones for attaining the water quality standard. Requirements for Section 319 funding eligibility were also considered.

Review of TMDL Development

The Lower Banister River, Winn Creek, and Terrible Creek TMDL IP addresses bacteria impairments within these three watersheds located within the County of Halifax as well as the Town of Halifax. Development of the bacteria TMDLs for Banister River and Winn Creek in 2013 used the *E. coli* water quality standard of a geometric mean concentration of 126 colony forming units (cfu)/100 ml and a single sample maximum concentration of 235 cfu/100 ml. The Terrible Creek segment was listed as impaired after completion of the Banister River and Winn Creek TMDL (VADEQ, 2013a) and it was not included in that TMDL report. Because the

Terrible Creek segment was nested in the Banister River TMDL, an actual TMDL was not required. Although, to aid in future implementation, a TMDL load allocation was developed for the creek during the development of this TMDL IP. Additionally, Banister Lake is currently not impaired; however, its subwatershed has been included in this TMDL IP in order to be able to address any future impairments, and to have the entire Banister River watershed covered under an implementation plan.

Bacteria assessments included a quantification of the bacteria sources and the types of land use for each subwatershed. The primary controllable source for both watersheds is nonpoint source runoff from pasture/hay land. Hydrologic Simulation Program FORTRAN (HSPF) modeling and development of the source load allocation scenarios considered the bacteria land uses and sources including residential and developed, cropland, pasture/hay, forest, water and wetlands, and other land uses and input from cattle and wildlife direct loading and failing sewage disposal systems/straight pipes. The Banister River allocation scenario provided for future growth by allocating an *E. coli* load equal to the existing point source load. For Winn Creek and Terrible Creek, an explicit allocation equivalent to 1% of the TMDL for the watershed was provided for the future growth of VPDES permitted point sources in the watershed. The reductions in bacteria loading include 100% reductions for cattle direct deposition and failing sewage disposal systems/straight pipes. The allocation scenarios used in this IP are presented in Table E-1.

Public Participation

Public participation in the development of an IP is important in order to educate and inform the local stakeholders about the issues and to solicit input on appropriate solutions. Participation involved public meetings, steering committees, and smaller working groups for agricultural, residential, and government stakeholders. The public meetings were held to educate the Public about the need for watershed cleanup, introduce the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP and the IP development process and progress, and highlight ways for the Public to get involved with the IP. The intent of the working groups was for the stakeholders to provide their specialized input concerning the watershed and best management practices. The working groups made recommendations for their areas of interest with education, outreach, and the funding being primary recommendations. The information and suggestions provided by each working group were used to develop the IP as applicable. The steering committee meeting

allowed for local stakeholders to provide final input prior to public comment. Additionally, technical aspects of the IP development process were discussed.

Table E-1: *E. coli* Load Reductions

Land Use/Source	Banister River	Winn Creek	Terrible Creek
Forest	0%	0%	0%
Cropland	75%	70%	31%
Pasture	75%	70%	31%
High Residential	75%	70%	31%
Medium Residential	75%	70%	
Low Residential	75%	70%	
Developed Open Space	75%	70%	
Cattle Direct Deposition	100%	100%	100%
Wildlife Direct Deposition	25%	64%	0%
Failing Sewage Disposal Systems/Straight Pipes	100%	100%	100%
Point Sources	-	-	-
Future Growth[1]	-	-	-
Total	**64%**	**66%**	**58%**

[1] For Banister River and Winn Creek, future growth is equal to 1x the existing point source load resulting in a total wasteload allocation of 2x the existing wasteload. For Terrible Creek, there are no individual VPDES municipal point source dischargers; the WLA includes 1 percent of the TMDL to account for future growth.

Implementation Actions

Implementation actions necessary to reduce the bacteria loads and associated costs and pollutant removal efficiencies were identified through extensive stakeholder input, public participation, and review of land use/source data and pollutant delivery mechanisms. Published reference materials used include the Virginia Agricultural Cost Share Best Management Practices (BMP) Manual, Virginia Stormwater BMP Clearinghouse, and the Virginia Stormwater Management Handbook.

Quantifiable BMPs proposed in this implementation plan are grouped by the land use (i.e., agricultural or residential) or pollution source with which the BMPs are associated such as livestock or pet waste. The proposed BMPs were quantified to meet the bacteria reductions called for in the TMDLs. TMDL IPs are designed to meet TMDL pollutant reduction targets within a watershed based on land use as defined by TMDL studies. Site-specific analysis is required prior to the siting, design, and implementation of the BMPs.

Table E-2 presents the various BMPs proposed in the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP and the cost associated with each BMP. These include residential BMPs, stormwater BMPs, Livestock Exclusion Systems, and pasture BMPs. Technical assistance for agricultural and residential BMPs was also evaluated and proposed.

The main benefit of implementation of the various control measures is the improvement of the water quality of the lower Banister River and its tributaries. Reducing bacteria loads in the watersheds will protect human health and safety, promote healthy aquatic communities, improve agricultural production, and add to the economic vitality of communities through enhancement of residential property, reduction in flood losses, and opportunities for outdoor recreation.

Goals and Milestones of the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP

The primary goals of the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP are to restore water quality in the impaired waterbodies and de-list the impaired segments from the Virginia 303(d) List of Impaired Waters for bacteria impairments. This IP describes specific implementation and water quality milestones, the link between implementation and water quality improvement, a timeline for implementation, and tracking and monitoring to measure implementation of achievements.

Implementation milestones establish the amount of control measures installed within prescribed timeframes, while water quality milestones establish the corresponding improvements in water quality that can be expected as the implementation milestones are met. The implementation of control measures proposed in the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP will take place over two stages in a ten-year timeline. The first stage focuses on implementing the more cost-effective and commonly implemented actions such as livestock exclusion practices, some pasture BMPs, and septic system repairs and should achieve the delisting goal. The second stage goal is to achieve reductions set by the TMDLs while implementing the remainder of the more expensive BMPs. The IP addresses implementation actions to reduce the human-induced sources of bacteria and does not address the direct or indirect wildlife reductions in the TMDLs.

Table E-2: Lower Banister River, Winn Creek, and Terrible Creek TMDL IP - Proposed BMPs and Costs per BMP			
Best Management Practice	Unit	Cost Per Unit	Number of Units
Residential BMPs			
Septic System Pump-Out (RB-1)	System	$200	258
Sewer Connection (RB-2)	System	$3,200	8
Repaired Septic System (RB-3)	System	$3,000	67
Septic System Installation/Replacement (RB-4)	System	$6,000	25
Septic System Installation/Replacement with Pump (RB-4P)	System	$8,000	5
Alternative Waste Treatment System Installation (RB-5)	System	$15,000	4
Pet Waste Education Campaign	System	$5,000	1
Pet Waste Station	System	$4,070	13
Pet Waste Digester	System	$100	146
Stormwater BMPs			
Infiltration Trench	Acre Treated	$11,300	24
Bioretention	Acre Treated	$15,000	24
Rain Garden	Acre Treated	$5,000	149
Constructed Wetland	Acre Treated	$2,900	24
Manufactured BMP	Acre Treated	$20,000	2
Livestock Exclusion Systems			
CREP Livestock Exclusion (CRSL-6)	System	$26,500	12
Livestock Exclusion (EQIP)	System	$20,600	20
Livestock Exclusion with Grazing Land Management for TMDL IP (SL-6/SL-6T/LE-1T)	System	$20,600	75
Small Acreage Grazing System (SL-6AT)	System	$13,500	2
Livestock Exclusion with Reduced Setback (LE-2/LE-2T)	System	$14,000	9
Stream Protection/Fencing (WP-2/WP-2T)	System	$8,000	7
Pasture BMPs			
Vegetative Cover on Critical Areas (SL-11)	Acre Installed	$1,900	1,080
Reforestation of Erodible Pasture (FR-1)	Acre Installed	$450	748
Pasture Management (EQIP 528, SL-10T, SL-9)	Acre Installed	$75	10,652
Wet Detention Ponds for Pastureland	Acre Treated	$150	375

The HSPF model was used to determine the percent exceedance of the geometric and single sample maximum water quality criterion for each stage (or milestone) for each subwatershed. Since Banister Lake is not impaired, the watershed does not have water quality milestones to meet.

Table E-3: Water Quality Milestones - Bacteria Criteria Exceedances per IP stage					
Stage	**Exceedance Criteria**	**Lower Banister River**	**Winn Creek**	**Terrible Creek**	**Banister Lake**
Stage I	% Exceedance Geometric Mean (126 cfu/100 mL)	15%	4%	0%	N/A
	% Exceedance Single Sample Maximum (235 cfu/100 mL)	10%	12%	6%	N/A
Stage II	% Exceedance Geometric Mean (126 cfu/100mL)	15%	1%	0%	N/A
	% Exceedance Single Sample Maximum (235 cfu/100 mL)	9%	10%	5%	N/A

Part of the staged implementation process includes the targeting of more specific locations for BMP implementation. Specific analysis within the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP targeted subwatersheds for residential on-site sewage disposal and livestock exclusion practices.

Implementation tracking and monitoring are two actions used to evaluate changes in the watershed and progress toward meeting water quality milestones. Implementation actions should be tracked to ensure that BMPs are adequately installed and maintained. BMP tracking would include quantification of the various BMPs identified in the IP and a reporting of the applicable units that are installed in each subwatershed. To allow for the effectiveness of BMPs, VADEQ would focus monitoring efforts on the original listing stations for the bacteria impairments after a period of at least two years of implementation project installation in a particular subwatershed.

Stakeholders Roles and Responsibilities

Stakeholders are individuals or groups who live or have land management responsibilities in the watershed, including federal, state and local government agencies, businesses, special interest groups, and citizens. Stakeholder participation and support is essential for improving water quality and removing streams from the impaired waters list. These stakeholders worked together to develop the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP through meeting attendance, comments and suggestions on various aspects of the plan, and through the provision of watershed and water quality data. In the future, many will also play a role in the implementation of the control measures described in the IP.

Federal government stakeholders include the U.S. Environmental Protection Agency (EPA) and the Natural Resources Conservation Service (NRCS). EPA oversees the Clean Water Act programs and NRCS provides technical expertise and financial resources to both private stakeholders and government agencies for conservation of natural resources.

Currently, there are six state agencies that have a major role in regulating and/or overseeing statewide activities that impact water quality. These include: VADEQ, Virginia Department of Conservation and Recreation (VADCR), Virginia Department of Agriculture and Consumer Services (VDACS), Virginia Department of Health (VDH), Virginia Department of Forestry (VDOF), and Virginia Cooperative Extension (VCE). VADEQ is the lead state agency in the TMDL process. The other agencies administer water quality related programs and provide technical and financial assistance for water quality improvement projects and BMPs. VADEQ and VDH participated in the TMDL IP development process.

Local government groups work closely with state and federal agencies throughout the TMDL process; these groups possess insights about their community that may help to ensure the success of TMDL implementation. Soil and water conservation districts (SWCDs) work closely with watershed residents such as farmers, ranchers and other land users to aid in understanding and implementing conservation practices. Planning District Commissions (PDCs) promote the efficient development of the regional physical, social, and economic resources. PDCs focus much of their efforts on water quality planning. City and county government staff work closely with PDCs and state agencies to develop and implement TMDLs, promote education and outreach to stakeholders on the TMDL process, and can enact ordinances that reduce water pollutants and support BMPs.

Community watershed and conservation groups offer opportunities for river and land conservation groups to share ideas and coordinate preservation efforts, often provide valuable knowledge of the local watershed and river habitat that is important to the implementation process, and can be a showcase site for citizen action. Citizens and businesses are involved in the TMDL and IP processes through participation in public meetings, assistance with public outreach and education, provision of local watershed history, and/or implementation of BMPs on their property to help restore water quality. Community civic groups perform a wide range of

community service including environmental projects where they assist in the public participation process, educational outreach, and with implementation activities in local watersheds. Animal clubs and associations provide a resource to assist and promote conservation practices among farmers and other land owners especially in rural areas and urban areas where pet waste has been identified as a source of bacteria in water bodies.

Integration with Other Watershed Plans

Water quality issues and improvement in the Lower Banister River, Winn Creek, and Terrible Creek watersheds is a component of many different organizations, programs and activities. Examples of these voluntary and regulatory efforts include watershed implementation plans, TMDLs, water quality management, erosion and sediment control regulations, stormwater management programs, source water assessment programs, local comprehensive and strategic plans, and local environmentally-focused organizations. Efforts in the Lower Banister River, Winn Creek, and Terrible Creek watersheds that coincide with the goals of the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP include various watershed-wide plans and programs, other TMDL implementation plans, and monitoring.

Frequently regional and local plans and programs focus on protecting and enhancing watershed attributes such as natural resources and water quality and quantity as well as providing public education. The Virginia Scenic Rivers Program and Southern Virginia Wild Blueway aim to protect river and lake systems in the area and promote recreational use. Two other TMDL implementation plans have been developed within the Banister River watershed to improve water quality and delist other impaired segments. Approval of the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP would put the entire length of the Banister River under an implementation plan. Voluntary citizen monitoring programs educate the public about water quality issues and can assist in the listing or delisting of impaired waters, TMDL development, tracking the progress of TMDLs or implementation plans, and identifying waters for potential future VADEQ monitoring.

Potential Funding Sources

Funding sources that may be available to support the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP include:

Federal

- Federal Clean Water Act Section 319 Incremental Funds
- United States Fish and Wildlife Service (USFWS) grants
- United States Department of Agriculture (USDA) – Farm Service Agency (FSA)
    - Conservation Reserve Program (CRP)
    - Conservation Reserve Enhancement Program (CREP)
- USDA – Natural Resources Conservation Service (NRCS)
    - Conservation Stewardship Program (CSP)
    - Environmental Quality Incentives Program (EQIP)
    - Agricultural Lands Easement Program

State

- Virginia Agricultural Best Management Practices (BMPs) Cost-Share Program
- Virginia Agricultural Best Management Practices Loan Program
- Virginia Agricultural Best Management Practices Tax Credit Program
- Virginia Clean Water Revolving Loan Fund
- Virginia Department of Environmental Quality Citizen Water Monitoring Grant Program
- Virginia Outdoors Foundation (VOF)
- Virginia Department of Environmental Quality
    - Virginia Small Business Environmental Compliance Assistance Loan Fund
    - Virginia Stormwater Local Assistance Fund (SLAF)
    - Virginia Water Quality Improvement Fund
- Virginia Indoor Plumbing Rehabilitation (IPR) Program

Regional and Private

- Community Development Block Grant (CDBG)
- National Fish and Wildlife Foundation (NFWF)
- Five Star and Urban Waters Restoration Grant Program
- Southeast Rural Community Assistance Project (SERCAP)
- Virginia Environmental Endowment
- Wetland and Stream Mitigation Banking
- Tri-County Community Action Agency, Inc.

1.0 Introduction

The Clean Water Act (CWA) requires that streams, rivers, and lakes within the United States meet specified water quality standards and that states conduct monitoring to identify waterbodies that are polluted and do not meet these standards. When streams fail to meet the standards, Section 303(d) of the CWA and the U.S. Environmental Protection Agency's (EPA) Water Quality Management and Planning Regulation (40 CFR Part 130) requires states to develop a Total Maximum Daily Load (TMDL) for each pollutant. A TMDL determines the maximum amount of pollutant loading that a waterbody can receive without exceeding the appropriate water quality standards. Once a TMDL is developed, states work with local stakeholders to develop an implementation plan to address the pollutant sources impairing the waterbodies and meet the TMDL. The ultimate goal is to delist the waterbody from the impaired waters list.

Required monitoring performed by the Commonwealth of Virginia identified stream segments within the Banister River and Winn Creek watersheds that did not meet the *Escherichia coli* (*E. coli*) standard and therefore did not protect the recreation beneficial use. TMDLs were developed and approved for these impaired segments and presented in the report, *Bacterial TMDL Development for the Banister River (BAN06A08) and Winn Creek (WNN01A06) Watersheds* (VADEQ, 2013a). Since the development of the TMDLs, a segment on Terrible Creek, tributary to the Banister River, was found to be impaired for *E. coli* (VADEQ, 2014) and was addressed within this implementation plan (IP). While there are no impaired segments within the Banister Lake watershed, this drainage area was included within the TMDL IP study area as well, since it is a potential contributor to bacteria loads in the river downstream. This results in the entire Banister River watershed under a TMDL implementation plan. Chapter 3 describes the incorporation of the impaired segment on Terrible Creek and the inclusion of the Banister Lake watershed within this IP.

1.1 Purpose of the Implementation Plan

After development and approval of a TMDL, certain actions and measures must be implemented in order to reduce the bacteria load in the impaired waterbodies and to work towards meeting the *E. coli* water quality standard. The Lower Banister River, Winn Creek, and Terrible Creek

bacteria TMDL IP describes the measures and details a phased implementation process necessary to reduce the bacteria sources contributing to the impaired waterbodies. These measures include best management practices (BMPs) and educational programs. The purpose of this TMDL IP is to provide a plan to reduce bacteria and to restore the waterbodies to conditions that support the primary contact recreation use. The phased TMDL IP should allow for cost-effective reduction in bacteria as well as improve local opportunities to receive financial and technical assistance during implementation.

1.2 Implementation Plan Components

The components discussed in the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP include:

- State and federal requirements for implementation plans;
- Review of the bacteria TMDL development study including descriptions of the watersheds and associated land use, the impairments, modeling, pollutant sources and existing loads, and the incorporation of the impaired segment not included in the original TMDL study;
- Public participation process including steering committee, working group, and public meetings;
- Implementation actions including identification of existing or future BMPs and management activities, determination of BMP reduction efficiencies, quantification of type and numbers of control measures required, a cost-effectiveness analysis, and a summary of potential benefits from implementing control measures;
- Measurable goals and milestones for attaining water quality standards including timelines for implementation and corresponding achievement of water quality improvements, number and type of implementation measures installed in each timeframe, and monitoring of these milestones;
- Roles and responsibilities of watershed stakeholders including outreach and educational actions;

- Description of other watershed plans and ongoing activities that could support implementation efforts; and
- Potential funding sources for implementation actions.

1.2.1 Wildlife Contributions

The bacteria TMDLs demonstrate that the existing wildlife loads in each subwatershed are all considerable. Neither the Commonwealth of Virginia nor EPA is proposing the elimination of wildlife to allow for the attainment of water quality standards. Not only is this an impractical action but the reduction of wildlife or the changing of natural background conditions is not the intended goal of a TMDL IP. Although the TMDLs include a reduction in bacteria loads from direct wildlife sources, addressing bacteria loads from wildlife is neither feasible nor addressed in this TMDL IP. Instead, the TMDL IP proposes an adaptive, iterative implementation approach to implement reasonable and practicable control actions. If, after implementation of these control actions, exceedances of the water quality standard persist due to wildlife loadings, then a special study called a Use Attainability Analysis (UAA) may become necessary. A UAA could address the removal and re-designation of the existing designated use. A UAA collects and analyzes various factors (e.g., physical, chemical, biological, chemical, and economic) affecting the attainment of the designated use as described in the federal regulations under 40 CFR §131.10(g).

2.0 State and Federal Requirements for Implementation Plans

There are a number of state and federal requirements and recommendations for TMDL IPs. The goal of this chapter is to define these and state if the elements are a required component of an approvable IP or are merely a recommended topic that should be covered in a thorough IP. This chapter has three sections that discuss the (a) requirements outlined by the Water Quality Monitoring, Information, and Restoration Act (WQMIRA) that must be met in order to produce an IP that is acceptable and approvable by the Commonwealth, (b) EPA recommended elements of IPs, and (c) required components of an IP in accordance with Section 319 guidance.

2.1 State Requirements

The TMDL IP is a requirement of Virginia's 1997 Water Quality Monitoring, Information, and Restoration Act (§62.1-44.19:4 through 19:8 of the Code of Virginia). WQMIRA directs Virginia Department of Environmental Quality (VADEQ) to "develop and implement a plan to achieve fully supporting status for impaired waters." In order for IPs to be approved by the Commonwealth, they must meet the requirements as outlined by WQMIRA. To meet the requirements of WQMIRA, IPs must include the following:

- Date of expected achievement of water quality objectives;
- Measureable goals;
- Necessary corrective actions; and
- Associated costs, benefits, and environmental impact of addressing the impairment.

2.2 Federal Requirements

Section 303(d) of the CWA and current EPA regulations do not require the development of implementation strategies. EPA does, however, outline the minimum elements of an approvable IP in its 1999 "Guidance for Water Quality-Based Decisions: The TMDL Process" (EPA, 1999).

The listed elements in EPA (1999) include:

- a description of the implementation actions and management measures,
- a timeline for implementing these measures,
- legal or regulatory controls,
- the time required to attain water quality standards, and
- a monitoring plan and milestones for attaining water quality standards.

2.3 Requirements for Section 319 Funding Eligibility

EPA develops guidelines that describe the process and criteria to be used to award CWA Section 319 nonpoint source grants to states. Congress amended the CWA in 1987 to establish the 319 Nonpoint Source Management Program. Under Section 319, States, Territories, and Indian Tribes receive grant money, which supports a wide variety of activities including the restoration of impaired waters. The guidance is subject to revision and the most recent version should be considered for IP development. The "Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003" identifies the following nine elements that must be included in the IP to meet the 319 requirements:

1. Identify the causes and sources of groups of similar sources that will need to be controlled to achieve the load reductions estimated in the watershed-based plan;
2. Estimate the load reductions expected to achieve water quality standards;
3. Describe the nonpoint source (NPS) management measures that will need to be implemented to achieve the identified load reductions;
4. Estimate the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the watershed-based plan;
5. Provide an information/education component that will be used to enhance public understanding of the project and encourage the public's participation in selecting, designing, and implementing NPS management measures;
6. Provide a schedule for implementing the NPS management measures identified in the watershed based plan;

7. Describe interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented;
8. Identify a set of criteria for determining if loading reductions are being achieved and progress is being made towards attaining water quality standards, and if not, the criteria for determining if the watershed-based plan needs to be revised; and
9. Establish a monitoring component to evaluate the effectiveness of the implementation efforts.

More information on the requirements for Section 319 fund eligibility is available at:

- *http://www.deq.state.va.us/Programs/Water/WaterQualityInformationTMDLs/NonpointSourcePollutionManagement.aspx*
- *http://water.epa.gov/polwaste/nps/cwact.cfm*

3.0 Review of TMDL Development

The Lower Banister River, Winn Creek, and Terrible Creek TMDL IP addresses three bacteria impairments within four subwatersheds (including the unimpaired Banister Lake watershed) located within Halifax County. The Lower Banister River and Banister Lake subwatersheds are partially located within the boundaries of the Town of Halifax. The impairments on the Banister River and Winn Creek were addressed within the TMDL study (VADEQ, 2013a), while the bacteria-impaired segment on Terrible Creek is assigned in this IP an existing bacteria load and bacteria allocations to be met.

3.1 Watershed Characterization and Impairment Listings

The four subwatersheds included within this TMDL IP (Banister River, Winn Creek, Terrible Creek, and Banister Lake) are shown in Figure 3-1. They are located within the most downstream portion of the larger Banister River watershed and cover an area of 62,557 acres, consisting predominantly of forest and pasture/hay land uses.

The Banister River and Winn River impaired segments, VAC-L71R_BAN06A08 and VAC-L71R_WNN01A06, respectively, were first listed as impaired on the Virginia 2008 303 (d) Total Maximum Daily Load Priority List and Report due to exceedances of the state water quality standard for *E. coli* (VADEQ, 2008). Due to these exceedances, the primary contact recreation use was not supported along a total of 9.33 miles of these waterbodies (Table 3-1). Development of the TMDL was based on the *E. coli* water quality standard. Winn Creek meets the Banister River approximately 3.5 miles downstream from Banister Lake. From there, the river flows southeast for approximately eight miles to its confluence with the Dan River. The dominant land uses consist of forest (58%) and pasture (17%) and are distributed throughout the watersheds.

Terrible Creek headwaters are located north of the Banister River. Terrible Creek flows south until its confluence with the Banister River just downstream of the Banister Lake Dam. The watershed has an area of approximately 24,860 acres. The dominant land uses are forest (52%) and pasture/hay (21%). Terrible Creek was first listed on the Virginia Draft 2014 305(b)/303(d) Water Quality Assessment Integrated Report (December 2014) due to exceedances of the state water quality standard for *E. coli* (VADEQ, 2014). Due to these exceedances, the primary

contact recreation use was not supported along a total of 4.77 miles of the waterbody. This segment was listed as impaired after completion of the Banister River and Winn Creek TMDL (VADEQ, 2013a) and it was not included in that report. The newly listed segment was nested in Terrible Creek, therefore an actual TMDL was not required. A TMDL load allocation was developed for Terrible Creek during the TMDL IP process to aid in future implementation and is discussed in Sections 3.2.2 and 3.3.2.

Banister Lake is located upstream of the Banister River impaired segments and it drains a 5,637 acre watershed (Figure 3-1). The main land use is forest (70%), followed by pasture/hay (17%). Although Banister Lake is currently not impaired, its subwatershed has been included in this TMDL IP. The *Lower Banister River Watershed Implementation Plan* (VADCR, 2012) coverage of the river watershed ends at Banister Lake. In order to be able to address any future impairments in the Banister Lake watershed, it was incorporated in this TMDL IP.

Table 3-1: Impairment Summary

Cause Group ID	Assessment Unit	Stream Name	Length (miles)	Boundaries	Cause
L71R-04-BAC	VAC-L71R_BAN06A08	Banister River	2.39	Banister River from its confluence with Wolf Trap Creek to its mouth on the Dan River	*Escherichia coli*
L71R-06-BAC	VAC-L71R_WNN01A06	Winn Creek	6.94	Winn Creek from its headwaters to the mouth on the Banister River	
L72R-01-BAC	VAC-L72R_TRR01A00	Terrible Creek	4.77	Terrible Creek from Little Terrible Creek to its mouth on Banister River	

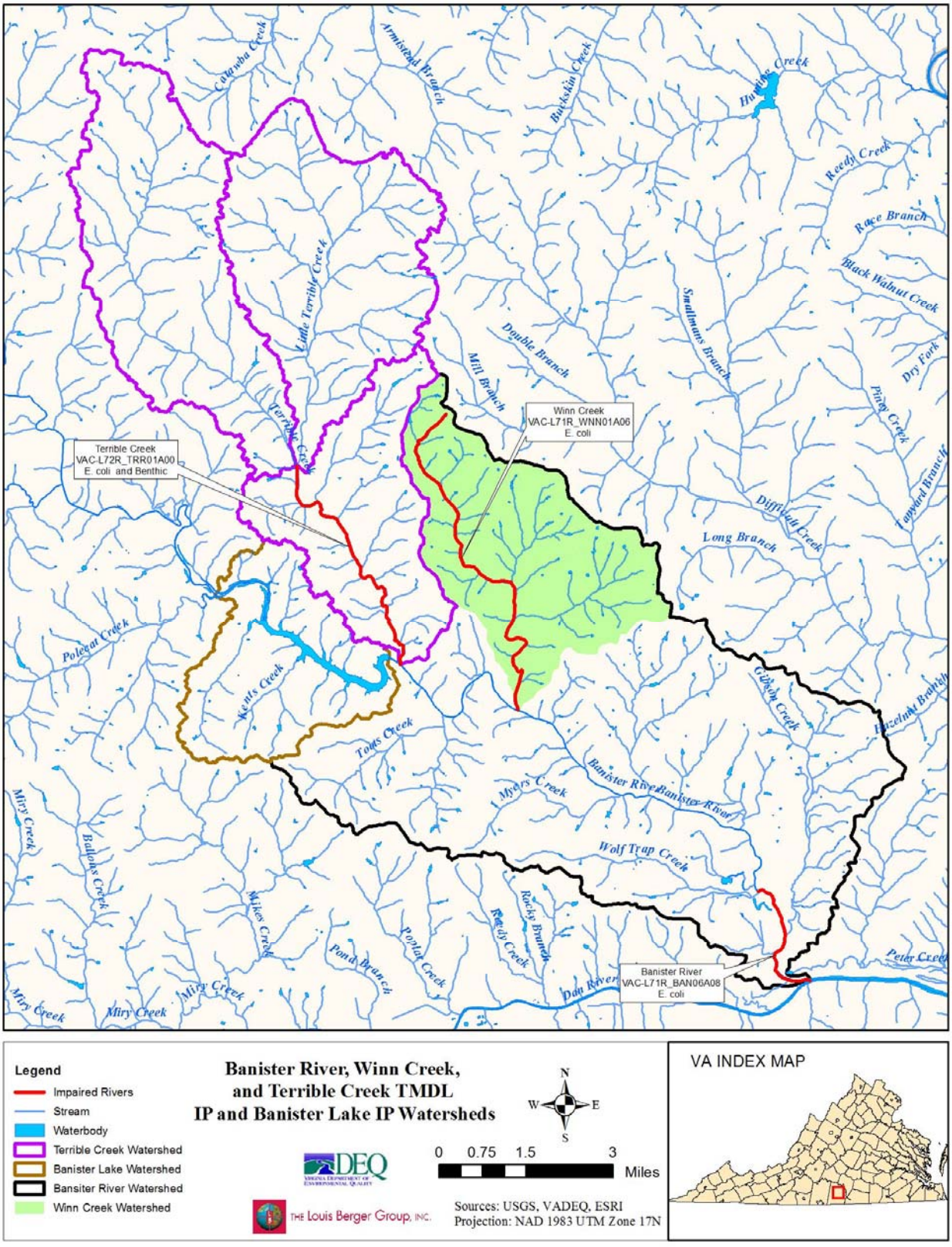

Figure 3-1. Subwatersheds and Impaired Segments

3.2 Bacteria Source Assessment

The source assessment included a quantification of the bacteria sources and the types of land use in order to determine the potential bacteria loads from each source and/or land use. Presented below is a summary of the source assessment for Banister River and Winn Creek from the TMDL (VADEQ, 2013a), followed by a source assessment for Terrible Creek and Banister Lake.

3.2.1 Banister River and Winn Creek

Contributors to bacteria loading within the Banister River and Winn Creek watersheds include NPS runoff from various land uses as well as permitted facilities, failing sewage disposal systems and straight pipes, livestock, wildlife, and pets (Tables 3-2 and 3-3). The EPA Bacterial Indicator Tool distributed *E. coli* loads among these sources (EPA, 2001). The primary source for both watersheds is NPS runoff from pasture/hay land. Urban/Residential land uses contribute approximately 29% of the total load within the Banister River watershed and approximately 9% within Winn Creek watershed.

Table 3-2: Banister River Existing *E. coli* Load Distribution

Land Use/Source	Annual Average *E. coli* Loads	
	cfu/year	%
Forest[1]	6.03E+12	9.8
Cropland[1]	7.93E+11	1.3
Pasture/Hay[2]	2.32E+13	37.6
High Residential[3]	2.63E+12	4.3
Medium Residential[3]	3.63E+12	5.9
Low Residential[3]	8.33E+12	13.5
Developed Open Space[3]	3.01E+12	4.9
Cattle Direct Deposition	6.49E+12	10.5
Wildlife Direct Deposition	6.82E+12	11.0
Failing Sewage Disposal Systems/Straight Pipes	8.38E+11	1.4
Total	**6.18E+13**	**100**

[1] *E. coli* load contributed by wildlife.
[2] *E. coli* load contributed by wildlife and livestock.
[3] *E. coli* load contributed by wildlife and pets.

Table 3-3: Winn Creek Existing *E. coli* Load Distribution		
Land Use/Source	**Annual Average *E. coli* Loads**	
	cfu/year	**%**
Forest[1]	1.58E+12	10.1
Cropland[1]	5.08E+11	3.3
Pasture/Hay[2]	8.11E+12	52.0
High Residential[3]	3.04E+10	0.2
Medium Residential[3]	3.18E+10	0.2
Low Residential[3]	7.69E+11	4.9
Developed Open Space[3]	5.49E+11	3.5
Cattle Direct Deposition	2.20E+12	14.1
Wildlife Direct Deposition	1.74E+12	11.2
Failing Sewage Disposal Systems/Straight Pipes	9.04E+10	0.6
Total	**1.56E+13**	**100**

[1] *E. coli* load contributed by wildlife.
[2] *E. coli* load contributed by wildlife and livestock.
[3] *E. coli* load contributed by wildlife and pets.

3.2.2 Terrible Creek and Banister Lake

The Terrible Creek watershed was divided into three model segments and the bacteria source assessment was calculated on a segment basis. Much of the source assessment is based on the National Land Cover Database (NLCD) 2006 land use distribution (Table 3-4). Banister Lake is not impaired for bacteria, but since the area is included in the TMDL IP, a source assessment was developed to determine which types of BMPs would be applicable to the subwatershed. The detailed source assessments (Appendix A) include estimations of human sources (sewage disposal), pets, agricultural sources (livestock distributions), and wildlife populations. There are no municipal Virginia Pollutant Discharge Elimination System (VPDES) permitted facilities that discharge into the Terrible Creek bacteria impaired watershed. The primary sources of bacteria in Terrible Creek are direct deposition from livestock and NPS runoff from pasture/hay and urban land (Table 3-5).

Table 3-4: National Land Cover Dataset (NLCD) 2006 for Terrible Creek and Banister Lake Watersheds		
Land Use Category	**Terrible Creek**	**Banister Lake**
Forest	15,920	3,965
Cropland	214	4
Pasture/Hay	6,243	933
Medium Residential	9	2
Low Residential	67	40
Developed Open Space	1,015	285
Water/Wetland	1,394	408
Total	**24,860**	**5,637**

Table 3-5: Terrible Creek Average *E. coli* Loads		
Land Use/Source	**Average *E. coli* Loads (cfu/year)**	**Percent**
Forest	9.94E+11	2.0
Cropland	4.96E+11	1.0
Pasture/Hay	1.57E+13	31.0
Residential and Developed open space	6.93E+12	13.7
Wetland and Water	3.15E+10	0.1
Cattle Direct Deposition	2.22E+13	43.8
Wildlife Direct Deposition	4.13E+12	8.2
Failing Sewage Disposal Systems/Straight Pipes	7.80E+10	0.2
Total	**1.56E+13**	**100**

3.3 Water Quality Modeling and Allocation Summary

The TMDLs for the Lower Banister River and Winn Creek watersheds were developed in 2013 using the calibrated Hydrologic Simulation Program FORTRAN (HSPF) model to simulate the hydrology and bacteria fate and transport in these impaired reaches. HSPF is a hydrologic, watershed-based water quality model that explicitly accounts for specific physical conditions of a watershed, variations in rainfall and climate, and various bacteria sources. Development of the TMDLs used an implicit margin of safety to account for uncertainties in the relationship between effluent limitations and water quality. Allocation analysis incorporated the *E. coli* water quality standard consisting of a geometric mean criterion of 126 colony forming units (cfu)/100 ml and a single sample maximum criterion of 235 cfu/100 ml. TMDL modeling and development assumed that the Banister River watershed upstream of Banister Lake was meeting water quality standards in order to capture the water quality issues locally within the lower Banister River watershed.

Final allocations scenarios were designed to result in no more than a 10% exceedance rate of the maximum assessment criteria for *E. coli* of 235 cfu/100 mL, or if there are sufficient samples, to meet the monthly geometric mean criterion of 126 cfu/100 mL. Using this framework, all TMDLs required 100% reduction of human bacteria sources (i.e., failed septic systems and straight pipes) and direct livestock instream loading. No reductions were required from forested land uses because those existing loads are from indirect wildlife deposition.

3.3.1 Banister River and Winn Creek

Bacteria data were collected at one monitoring station on the Banister River and one station on Winn Creek for use in HSPF modeling and TMDL development. The Banister River and Winn Creek watersheds were divided into 29 smaller subwatersheds to represent the local watershed conditions and to improve the accuracy of the model. Using the existing conditions and various assumptions concerning streamflow and bacteria sources within these subwatersheds, the model was run iteratively while adjusting source contributions until the model runs resulted in attainment of the *E. coli* water quality standard. The model runs that resulted in attainment were considered the allocation scenarios.

Final allocated loads and percent reductions from bacteria sources for the Banister River and Winn Creek subwatersheds would meet the allocation scenario and water quality criteria (Tables 3-6 and 3-7). The Banister River allocation scenario provided for future growth by allocating an *E. coli* load equal to the existing point source load. For the Winn Creek watershed, an explicit allocation equivalent to 1% of the TMDL for the watershed was provided for the future growth of VPDES permitted point sources in the watershed.

Table 3-6: Banister River Load Allocation

Land Use/Source	Annual Average *E. coli* Loads (cfu/year)		Percent Reduction
	Existing	Allocation	
Forest	6.03E+12	6.03E+12	0%
Cropland	7.93E+11	1.98E+11	75%
Pasture	2.32E+13	5.80E+12	75%
High Residential	2.63E+12	6.58E+11	75%
Medium Residential	3.63E+12	9.08E+11	75%
Low Residential	8.33E+12	2.08E+12	75%
Developed Open Space	3.01E+12	7.53E+11	75%
Cattle Direct Deposition	6.49E+12	0.00E+00	100%
Wildlife Direct Deposition	6.82E+12	5.12E+12	25%
Failing Sewage Disposal Systems/Straight Pipes	8.38E+11	0.00E+00	100%
Point Sources	5.87E+11	5.87E+11	-
Future Growth[1]	0.00E+00	5.87E+11	-
Total	**6.24E+13**	**2.27E+13**	**64%**

[1] Future growth is equal to 1x the existing point source load resulting in a total wasteload allocation of 2x the existing wasteload.

Table 3-7: Winn Creek Load Allocation

Land Use/Source	Annual Average *E. coli* Loads (cfu/year)		Percent Reduction
	Existing	Allocation	
Forest	1.58E+12	1.58E+12	0%
Cropland	5.08E+11	1.52E+11	70%
Pasture/Hay	8.11E+12	2.43E+12	70%
High Residential	3.04E+10	9.12E+09	70%
Medium Residential	3.18E+10	9.54E+09	70%
Low Residential	7.69E+11	2.31E+11	70%
Developed Open Space	5.49E+11	1.65E+11	70%
Cattle Direct Deposition	2.20E+12	0.00E+00	100%
Wildlife Direct Deposition	1.74E+12	6.26E+11	64%
Failing Sewage Disposal Systems/Straight Pipes	9.04E+10	0.00E+00	100%
Future Growth[1]	0.00E+00	5.25E+10	-
Total	**1.56E+13**	**5.25E+12**	**66%**

[1] There are no individual VPDES municipal point source dischargers; the WLA includes 1 percent of the TMDL to account for future growth.

3.3.2 Terrible Creek

Bacteria data collected at one monitoring station on Terrible Creek were used in HSPF modeling and load allocation development. Bacteria source load allocations were developed for Terrible Creek during development of this IP. For consistency, the same HSPF model and assumptions from the Banister River TMDL (VADEQ, 2013a) were used. The Terrible Creek watershed was divided into three smaller subwatersheds to represent the local watershed conditions and to improve the accuracy of the model. Using the existing conditions (Table 3-5) and similar assumptions concerning streamflow and bacteria sources within these subwatersheds as for Banister River, the model was run iteratively while adjusting source contributions until the model runs resulted in attainment of the *E. coli* water quality standard. The model runs that resulted in attainment were considered the allocation scenarios.

Final allocated loads and percent reductions from bacteria sources for the Terrible Creek subwatershed to meet the allocation scenario and water quality criteria are presented in Table 3-8. An explicit allocation equivalent to 1% of the TMDL for the watershed was provided for the future growth of VPDES permitted point sources in the watershed. This is consistent with the approach taken for the Banister River and Winn Creek TMDLs.

Table 3-8: Terrible Creek Load Allocation

Land Use/Source	Annual Average *E. coli* Loads (cfu/year)		Percent Reduction
	Existing	Allocation	
Forest	9.94E+11	9.94E+11	0%
Cropland	4.96E+11	3.42E+11	31%
Pasture	1.57E+13	1.08E+13	31%
Residential and developed open space	6.93E+12	4.78E+12	31%
Wetland and Water	3.15E+10	3.15E+10	0%
Cattle Direct Deposition	2.22E+13	0.00E+00	100%
Wildlife Direct Deposition	4.13E+12	4.13E+12	0%
Failing Sewage Disposal Systems/Straight Pipes	7.80E+10	0.00E+00	100%
Future Growth[1]	-	2.13E+11	-
Total	**5.06E+13**	**2.13E+13**	**58%**

[1] There are no individual VPDES municipal point source dischargers; the WLA includes 1 percent of the TMDL to account for future growth.

4.0 Public Participation

Public participation in the development of any watershed implementation plan is important in order to educate and inform the local stakeholders about the issues and to solicit input on appropriate solutions. Meetings with the public, steering committee, and working groups (agricultural, residential, and government) were held to achieve these goals. Table 4-1 shows the date of each meeting as well as the specific type, location, and number of attendees. Minutes and notes from the steering committee and working group meetings were available online throughout the duration of IP development and are included in Appendix B.

Table 4-1: Meetings during Development of the Lower Banister River, Winn Creek, and Terrible Creek TMDL Implementation Plan

Date	Meeting Type	Attendance	Location
04/17/2014	Public Meeting #1 & Agricultural/Residential Working Groups #1	11	Mary Bethune Office Complex 1030 Cowford Road, Halifax, VA 24558
05/15/2014	Government Working Group #1	7	Virginia Cooperative Extension Office 171 South Main Street, Halifax, VA 24558
08/13/2014	Agricultural/Residential Working Groups #2	10	Mary Bethune Office Complex 1030 Cowford Road, Halifax, VA 24558
10/14/2015	Steering Committee Meeting #1	9	Virginia Cooperative Extension Office 171 South Main Street, Halifax, VA 24558
10/27/2015	Public Meeting #2	12	Mary Bethune Office Complex 1030 Cowford Road, Halifax, VA 24558

Stakeholders within a watershed include agencies, organizations, and individuals. Each of these stakeholders has knowledge and interest about existing watershed and water quality issues, conditions, resources, and management activities. By holding different types of meetings, each of these varied groups can provide their specialized input concerning the watershed and appropriate best management practices. The informational aspect of the meetings highlight the ongoing progress in the development process as well as the resultant outcomes, thus allowing for public input at several levels of plan development. Public participation could lead to citizen involvement in the watershed cleanup process through knowledge about available pollutant prevention measures.

4.1 Public Meetings

The first public meeting for the Lower Banister River, Winn Creek, and Terrible Creek watersheds cleanup plan was held on April 17, 2014. The main objective for this portion of the meeting was to introduce the Lower Banister River, Winn Creek, and Terrible Creek TMDL implementation plan and provide information to the public concerning the reasons the watershed must be cleaned up, the plan development process, modeling approach, and ways for the public to get involved. This meeting was also the first for the agricultural/residential working groups. The objective of this portion of the meeting was the discussion of opportunities for public participation through the working groups as well as the responsibilities of the working groups as discussed in Section 4.2. Input, comments, and questions were solicited from the public and stakeholders.

The final public meeting was held on October 27, 2015 with 12 participants. The main objective for this meeting was to identify and describe to the public the implementation plan proposed for the Lower Banister River, Winn Creek, and Terrible Creek watersheds. The presentation reviewed the BMPs and costs, implementation stages, implementation and water quality milestones, and the ways the public can stay involved in the process. The meeting explained the importance of having the entire Banister River watershed covered by an implementation including the benefits to human health and safety, agricultural production, and the local economy.

4.2 Agricultural/Residential Working Group Meetings

The first agricultural and residential working group meeting was held in conjunction with the first public meeting on April 17, 2014 with 11 participants. The second working group meeting was held August 13, 2014 with 10 participants. The working groups were given background information on the Lower Banister River, Winn Creek, and Terrible Creek TMDL implementation plan and process. The working group discussed residential issues related to septic systems, straight pipes, and pet waste. Agricultural issues revolved around existing land uses and potential BMPs.

In terms of on-site sewage disposal systems, group members communicated that there are few, if any, straight pipes or privies within the watershed. There are also no records of areas with failing systems. One main concern of the stakeholders is the need for funding to assist the public with repair or replacement of failing systems. Several organizations provide assistance with funding

and/or resources for insufficient waste disposal systems throughout the watershed. There is a need for outreach and education on septic system maintenance and operation and the resources available for these issues. Pet waste digesters, which are a new concept to the area, were introduced as a possibility for pet waste issues in the watersheds. Additionally, there is an existing pet waste educational campaign in the Banister River, Polecat Creek, and Sandy Creek watersheds through the Cooperative Extension Service with potential for a future expanded partnership in the subject IP area. The County of Halifax is opting out of the stormwater program, therefore the stormwater BMPs should be reviewed by the county.

In terms of the agricultural discussion, members thought that cattle numbers were increasing in the watershed and that runoff from pasture and grazing land was a large source of bacteria loading. Equestrian trails were also suggested as a possible source of bacteria. It was estimated that a large amount of pasture land use intersects intermittent streams and that stream exclusion BMPs should be assessed accordingly. The discussion focused on various BMPs to consider in the plan as well as the cost-share and stipulations associated with the BMPs. Stakeholders revealed that no manure application occurs within the watershed, therefore no additional cropland BMPs are necessary to address bacteria loads. Lastly, members revealed that the public would not be interested in land use conversion BMPs due to economic reasons and that acceptance of other BMPs (e.g., pasture management) would require a "cultural change" with word-of-mouth and firsthand knowledge of examples of success being the best promotional methods.

Over the course of the two meetings, the agricultural and residential working groups made recommendations on the discussion topics. Sewage disposal BMPs should be quantified using the septic and sewer failure rates (i.e., 4 percent) and the ratio for septic system repair and replacement identified in the earlier Banister River implementation plans. Costs of sewage disposal BMPs especially septic pumpouts and sewer connection were reviewed as was education related to septic systems. The members discussed the distribution of residential stormwater BMPs versus other residential BMP types. There was a suggestion to increase the proposed percentage of houses with septic systems that should perform septic system pump-outs. Several suggestions were made concerning possible partners for various residential BMPs. Land uses would dictate the types of BMPs proposed with education and outreach and the cost-efficient BMPs likely comprising a larger portion of the total. For pet waste, members suggested to account for the existing pet

stations, add other stations at appropriate sites, and account for the cost for maintenance of the stations. The agricultural discussion topics included BMPs, cost-share money availability, and requirements. The working group meeting notes and the group report to the steering committee are included in Appendix B.

4.3 Government Working Group Meetings

The government working group was held on May 15, 2015 with seven participants. The working group was presented with background information on the Lower Banister River, Winn Creek, and Terrible Creek TMDL implementation plan project with the discussions focused on several broad topics initially introduced in the other working groups including sewage disposal systems, pet waste, stormwater programs, and agricultural programs.

For sewage disposal systems, discussion centered on the calculation of failing septic systems and those that need repair, new installation, or an alternative waste treatment system. It was noted that septic system education including contacts for technical assistance could be provided by local organizations with experience in septic system-related grant projects. The county supports the cleanup process and would cooperate with stakeholders but has limited resources for implementation. Pet waste topics focused on locations for pet waste stations as well as issues with horse manure on trails and public roads in the area. A campaign is being developed for manure cleanup. The stormwater discussion revealed that Halifax County has opted out of the stormwater program for the time being; the county intends to hold off on administering the program until the state develops training and certification materials. Currently, the county administers the erosion and sediment control plans whereas the state administers the stormwater program. Finally, the discussion on agricultural programs and concerns included past and potential future funding sources, BMPs that are not used in the area, and the importance of livestock exclusion and pasture management practices as well as specific education or outreach for pasture and rotational grazing practices. Issues include direct and indirect stream degradation and overgrazing of newly acquired lands by cattle and goats. The group also discussed how degradation of the surrounding rivers could potentially affect area natural resources such as the Southern Virginia Blueway and fishing. Outreach on these relationships could stimulate the public to have more interest in the implementation plan. Additional dialogue highlighted local ordinances that could be helpful for reducing bacteria and/or sediment loads, monitoring strategies, and citizen monitoring. Meeting

notes and working group recommendations by the government working group are included in Appendix B.

4.4 Steering Committee Meetings

The first steering committee meeting was held on October 14, 2015 with 9 participants. The main objective for this meeting was to present to the committee the proposed BMPs, costs, staging and associated implementation and water quality milestones. Sewage disposal practices and livestock exclusion system BMPs were ranked on the opportunity for implementation and explained during a discussion on targeting. Specifics on the amount of necessary technical assistance were discussed and incorporated into the report. Additional information contained in the IP such as tracking and monitoring, stakeholder roles and responsibilities, other watershed plans, and funding sources was also reviewed. Suggestions and comments provided by committee members were taken into consideration during the final review and revision of the IP report.

5.0 Implementation Actions

Implementation actions necessary to reduce the bacteria loads were identified through stakeholder input, public participation, and review of land use/source data and bacteria delivery mechanisms. This chapter focuses on the controllable sources of bacteria loadings in the watershed. These controllable sources include direct deposition of bacteria by livestock; overland runoff from agricultural land (pasture); overland runoff from residential and developed, open space land; failing septic systems; and straight pipes. Described below is the following:

- Selection and quantification of appropriate implementation actions to reduce bacteria loading
- Steps needed toward meeting water quality standards
- Associated costs and benefits of the actions and technical assistance associated with implementing agricultural and residential BMPs.

The subsequent Chapter 6 provides the IP actions for each watershed in a successional manner among two stages as an iterative process toward meeting water quality goals.

5.1 Identification of Control Measures

Proposed measures to control bacteria were identified through multiple sources. Several common BMPs for reduction of bacteria loads were suggested in the original TMDL report including livestock exclusion and septic system BMPs (VADEQ, 2013a). Appropriate control measures were also identified through review of published materials such as stormwater BMP literature and the Virginia Agricultural Cost Share BMP Manual. Stakeholders at working group meetings provided input on existing and potential control measures. Additionally, some measures have been proposed based on existing Virginia TMDL IPs with similar watershed conditions.

Quantifiable BMPs proposed in this TMDL IP are listed in Table 5-1 grouped by land use (i.e., agricultural and residential) or pollution source associated with the BMPs. Also listed are bacteria removal efficiencies of each BMP and associated source documents.

Table 5-1: Best Management Practice Efficiency			
BMP Type	**BMP**	**Bacteria Removal Efficiency (%)**	**Reference**
Agricultural			
Livestock Exclusion	CREP Livestock Exclusion (CRSL-6)	100	1
	Livestock Exclusion (EQIP)	100	1
	Livestock Exclusion with Grazing Land Management (SL-6/SL-6T/LE-1T)	100	1
	Small Acreage Grazing System (SL-6AT)	100	1
	Livestock Exclusion with Reduced Setback (LE-2/LE-2T)	100	1
	Stream Protection/Fencing (WP-2/WP-2T)	100	1
Pasture	Vegetative Cover on Critical Areas (SL-11)	75	2
	Reforestation of Erodible Pasture (FR-1)	Land use conversion	2
	Pasture Management (EQIP 528, SL-10T, SL-9)	50	3
	Wet Detention Ponds for Pastureland	70	4
Residential			
Waste Treatment	Septic System Pump-Out (RB-1)	5	2
	Sewer Connection (RB-2)	100	1
	Repaired Septic System (RB-3)	100	1
	Septic System Installation/Replacement (RB-4)	100	1
	Septic System Installation/Replacement with Pump (RB-4)	100	1
	Alternative Waste Treatment System Installation (RB-5)	100	1
Pet Waste	Pet Waste Digester	99	1
	Pet Waste Education Campaign	50	5
	Pet Waste Station	Included in Pet Waste Education Campaign	N/A
Stormwater	Infiltration Trench	90	6
	Bioretention	90	7
	Rain Garden	70	8
	Constructed Wetland	80	4
	Manufactured BMP	80	9

CREP – Conservation Reserve Enhancement Program

BMP References (see column to the right):

1. Removal efficiency is defined by the practice.
2. VADCR. 2003.
3. EPA-CBP. 2006.
4. VADEQ. 2013b.
5. Swann. 1999.
6. EPA. 2014b.
7. EPA. 2014a.
8. Hunt et al. 2007.
9. VADCR. 2013a.

The BMP pollutant reduction efficiency values reported in Table 5-1 are averages and are subject to revision based on actual conditions present at the sites where each BMP is implemented. This is a planning level document and more accurate reduction efficiencies would be dependent on site conditions, BMP design and implementation. Additional information pertaining to stormwater BMPs can be found on the websites for the Virginia Stormwater BMP Clearinghouse (*http://www.vwrrc.vt.edu/swc/*) and the Virginia Stormwater Management Handbook (*http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications.aspx*).

5.2 Quantification of Control Measures

The first step in the process to determine the number of each type of BMP was to identify existing BMPs. The BMPs that were implemented before 2011 and their associated removal of bacteria loads had already been taken into account in the development of the TMDLs for the Banister River and Winn Creek watersheds (VADEQ, 2013a). The bacteria reductions from the BMPs implemented after 2011 were accounted for in the BMP quantification within this TMDL IP. Following identification of existing BMPs and the assessment of their bacteria removal capabilities, additional BMPs were proposed to achieve the TMDL pollutant reduction goals. The quantification procedures for proposed agricultural and residential land use BMPs are detailed below. Determining specific locations for the proposed BMPs is not a goal of this TMDL IP; site-specific analysis would be required prior to the siting, design, and implementation of the BMPs.

The BMPs proposed in the following sections will address bacteria pollution in the Lower Banister River, Winn Creek, and Terrible Creek watersheds. The BMPs were quantified to meet the bacteria reductions called for in the TMDLs (VADEQ, 2013a).

5.2.1 Agricultural Control Measures

This section describes the BMPs associated with agricultural activities, summarizing the existing and proposed livestock exclusion and pasture BMPs needed to meet the bacteria reductions called for in the TMDLs.

5.2.1.1 Livestock Exclusion

In the time period between the development of the TMDL and this TMDL IP, livestock exclusion BMPs have been implemented in the Winn Creek and Terrible Creek subwatersheds. Table 5-2

presents the Stream Exclusion with Grazing Land Management (SL-6) livestock exclusion BMPs, funded with state cost-share funds, implemented after the TMDL modeling and development period.

Table 5-2: Existing Livestock Exclusion BMPs

BMP	Winn Creek	Terrible Creek
	Stream Length Protected (feet)	
Stream Exclusion with Grazing Land Management (SL-6) (linear feet)	16,029	1,975
Bacteria Reduction from Existing BMPs (cfu/yr)	9.63E+11	3.90E+11

Livestock exclusion BMPs proposed in this TMDL IP include CREP Livestock Exclusion (CRSL-6), Livestock Exclusion (EQIP), Livestock Exclusion with Grazing Land Management (SL-6/SL-6T and LE-1T), Small Acreage Grazing System (SL-6AT), Livestock Exclusion with Reduced Setback (LE-2/LE-2T), and Stream Protection/Fencing (WP-2/WP-2T). The overall length of all livestock exclusion systems proposed throughout the Lower Banister River, Winn Creek, and Terrible Creek watersheds was determined using a GIS spatial analysis of aerial imagery, land use (NLCD 2006), and NHD stream layers. Using data from the NLCD 2006 land use layer and the aerial imagery, the length of streams with and without adequate riparian buffer was analyzed for all pasture areas. Next, a distribution percentage for each type of livestock exclusion BMP was determined based on guidance from the Natural Resources Conservation Service (NRCS) and Halifax Soil and Water Conservation District, with specific distributions identified for all subwatersheds. These distributions are 10% for CREP Livestock Exclusion, 15% for Livestock Exclusion (EQIP), 60% for Livestock Exclusion with Grazing Land Management, 2% for Small Acreage Grazing System, 7% for Livestock Exclusion with Reduced Setback, and 6% for Stream Protection/Fencing. In each subwatershed, the length of each proposed BMP was calculated by multiplying the overall length of all proposed livestock exclusion systems (as described above) by the appropriate distribution percentage. This length was then divided by the average length (based on local practices as reported by the VADCR Agricultural BMP Database) of each livestock exclusion system BMP to arrive at the number of each type of livestock exclusion BMP proposed for each subwatershed (Table 5-3). The average length of each livestock exclusion system was calculated from the lengths of the existing systems within the Lower Banister River, Winn Creek,

and Terrible Creek watersheds. Targeting of livestock exclusion systems to smaller subwatersheds is discussed in Chapter 6.

Table 5-3: Proposed Livestock Exclusion BMPs (systems)

BMP	Lower Banister River	Winn Creek	Terrible Creek	Banister Lake	Total
CREP Livestock Exclusion (CRSL-6)	4	1	6	1	**12**
Livestock Exclusion (EQIP)	7	2	9	2	**20**
Livestock Exclusion with Grazing Land Management for TMDL IP (SL-6/SL-6T/LE-1T)	27	7	34	7	**75**
Small Acreage Grazing System (SL-6AT)	1	-	1	0	**2**
Livestock Exclusion with Reduced Setback (LE-2/LE-2T)	3	1	4	1	**9**
Stream Protection/Fencing (WP-2/WP-2T)	3	-	3	1	**7**
Total	**45**	**11**	**57**	**12**	**125**

Example of Livestock Exclusion
(Photograph courtesy of USFWS)

5.2.1.2 Pasture BMPs

In the time period between the development of the TMDL and the TMDL IP, pasture BMPs have also been implemented in the Banister River and Winn Creek subwatersheds. Table 5-4 presents

the Reforestation of Erodible Crop and Pasture (FR-1) and Vegetative Cover on Critical Areas (SL-11) pasture BMPs implemented after the TMDL modeling and development period.

Table 5-4: Existing Pasture BMPs (acres installed)

BMP	Lower Banister River	Winn Creek
Reforestation of Erodible Pasture (FR-1)	1.0	2.1
Permanent Vegetative Cover on Critical Areas (SL-11)	4.0	1.7
Bacteria Reduction from Existing BMPs (cfu/yr)	1.60E+10	1.03E+10

The quantification of acres installed for the proposed pasture BMPs (Table 5-5) was based on the area of pasture located within each subwatershed and the pollutant reductions required from this land use. The approach to achieving bacteria reduction from pastureland was to first propose Reforestation of Erodible Pasture (FR-1) at a rate of 5% for all watersheds. In addition, Vegetative Cover on Critical Areas (SL-11) was proposed for 5 to 10% of all pastureland in each watershed. Pasture Management (EQIP 528, SL-10T, SL-9) was then applied to the remaining unconverted land until the TMDL bacteria reductions were met. Additional bacteria reductions to meet the TMDL allocations in Winn Creek subwatersheds were gained by proposing wet detention ponds in pastureland, quantified as acres treated. The wet detention ponds for pastureland would only be implemented if bacteria reductions from pastureland are insufficient to meet water quality goals set in the TMDL.

Table 5-5: Proposed Pasture BMPs (acres installed)

BMP	Lower Banister River	Winn Creek	Terrible Creek	Banister Lake	Total
Reforestation of Erodible Pasture (FR-1)	267	122	312	47	**748**
Vegetative Cover on Critical Areas (SL-11)	508	231	297	44	**1,080**
Pasture Management (EQIP 528, SL-10T, SL-9)	5,077	2,315	2,817	443	**10,652**
Wet Detention Ponds for Pastureland (acres treated)		375	-	-	**375**
Total	**5,852**	**3,043**	**3,426**	**534**	**12,855**

5.2.1.3 Cropland BMPs

The Halifax Soil and Water Conservation District reported no manure spreading on cropland within the Lower Banister River, Winn Creek, or Terrible Creek subwatersheds, therefore no

cropland BMPs were proposed in this TMDL IP. The uncontrollable wildlife bacteria load is the only bacteria loading on cropland.

5.2.2 Residential Bacteria Control Measures

5.2.2.1 Failing Septic Systems, Straight Pipes, Sewer Connections

Western VA Water Authority Sewerline Connection
(Photograph courtesy of VADEQ)

BMPs available to address failing septic and sewer systems consist of septic system pump-outs (RB-1), sewer connections (RB-2), septic system repairs (RB-3), septic system installation or replacement (RB-4), septic system installation or replacement with pump (RB-4P), and alternative waste treatment system installation (RB-5).

Quantification was based on a spreadsheet analysis using data on the number of homes on septic systems, number of failing sewer connections and septic systems, and straight pipes in each subwatershed. Only portions of the Banister River and Banister Lake subwatersheds are connected to the sewer system and a total of 20 failing septic systems have been corrected by connection to the sewer line maintained by the Halifax County Service Authority since 2008. Using this information, four sewer connections are proposed for both the Banister River and Banister Lake subwatersheds.

Table 5-6 presents the estimated number of homes with septic systems, failing septic systems, and straight pipes. The initial distribution of residential waste treatment systems among these systems based on input from the Virginia Department of Health was 70% for septic repair, 25% for septic install/replace, 3% for septic install/replace with pump, and 2% for alternative waste treatment systems. Winn Creek, Terrible Creek, and Banister Lake have a low number of failing septic systems, therefore the initial distribution in these watersheds were adjusted slightly to account for all potential practices in each watershed. If the original distribution of failing septic systems

resulted in less than one system per practice per subwatershed, then the number was rounded up to a whole system and the other numbers were adjusted accordingly. Septic pump-outs were recommended at 10% of houses on septic systems. All straight pipes were corrected with proposed septic system installation (RB-4, RB-4P). Table 5-7 details the number of septic system pump-outs, sewer connections, septic system repairs, new septic systems (install/replace), and alternative waste treatment systems for each subwatershed. Targeting of sewage disposal system corrections to smaller subwatersheds is discussed in Chapter 6.

Table 5-6: Septic System and Straight Pipe Estimates

Subwatershed	Total Homes on Septic	Failing Septic Systems (4% failure rate)	Straight Pipes
Banister River	1,501	60	3
Winn Creek	284	11	1
Terrible Creek	474	19	1
Banister Lake	334	13	1
Total	**2,593**	**103**	**6**

Table 5-7: Proposed Sewage Disposal BMPs (systems)

BMP	Lower Banister River	Winn Creek	Terrible Creek	Banister Lake	Total
Total Septic Pumpout (RB-1)*	150	28	47	33	**258**
Sewer Connection (RB-2)	4	-	-	4	**8**
Total Septic Repair (RB-3)	41	7	13	6	**67**
Total Septic Install/Replace (RB-4)	15	3	5	2	**25**
Total Septic Install/Replace with Pump (RB-4P)	2	1	1	1	**5**
Total Alternative Waste Treatment System (RB-5)	1	1	1	1	**4**

*10% of the total estimated houses on septic systems were proposed to be pumped out.

5.2.2.2 Pet Waste Reduction

Pet Waste Station
(Photograph courtesy of Scoopmasters.com)

BMPs proposed to reduce pet waste include pet waste stations, pet waste digesters, and pet waste education campaigns. There are three existing pet waste disposal stations in the Town of Halifax; two are in the Banister River subwatershed and one is in the Banister Lake subwatershed. Grants are used to fund maintenance (i.e., supply of bag refills) of these stations. Additionally, the Town of Halifax has a "Scoop the Poop" educational campaign to promote proper disposal of pet waste. A potential partner for pet waste education is the Cooperative Extension Service which supports an existing campaign in the Banister River, Polecat Creek, and Sandy Creek watersheds.

Pet waste is the only controllable bacteria source on developed (or residential) land use. Bacteria reductions from pet waste treatments were quantified slightly differently based on the intensity of residential land and the number of pet owning households in each subwatershed. Bacteria loads from high intensity residential land use were addressed by the pet waste education campaign and pet waste stations. Medium and low intensity residential land use loads were addressed by the pet waste education campaign, stations, as well as digesters (as discussed further below). Banister River is the only subwatershed with high residential land use. Winn Creek, Terrible Creek, and Banister Lake subwatersheds do not have high intensity residential land use and follow a similar approach as the medium/low intensity residential land use within Banister River. Table 5-8 presents the breakdown of bacteria reduction efficiencies for pet waste treatment BMPs for each watershed.

Pet waste digesters are in-ground pet waste disposal systems that function similar to a household septic system. The unit requires the addition of water and a digester enzyme mixture to break down dog waste into a liquid that is released to and absorbed by the underlying soil. The first step in the quantification process proposed pet waste digesters for 15% of pet-owning households for

the subwatersheds of Banister River and Winn Creek and for 5% of pet-owning households for Terrible Creek and Banister Lake subwatersheds.

Typical pet waste stations include pet waste trash bags, bag dispenser, a steel trashcan for waste disposal, and signage directing citizens about the importance of picking up after pets. This TMDL IP assumes a supply of bag refills at the pet waste stations for five years. The TMDL IP further is focused on placing pet waste disposal stations in locations where there is the likelihood of pet presence. For this watershed, those locations were assumed to be residential areas and parks. Appropriate areas for pet waste stations were determined through GIS analysis. The watersheds of Winn Creek and Terrible Creek are very rural resulting in few opportunities for the placement of pet waste stations. Figure 5-1 presents the existing and proposed pet waste stations.

Table 5-8: Proposed Pet Waste Treatment BMPs Reduction Efficiencies

BMP	Lower Banister River		Winn Creek	Terrible Creek	Banister Lake
	High Residential	Medium/ Low Residential			
Pet Waste Education Campaign (including pet waste station)	70%	50%	50%	50%	50%
Pet Waste Digester	N/A	15%	15%	5%	5%
Total Pet Waste Reduction Efficiency	70%	65%	65%	55%	55%

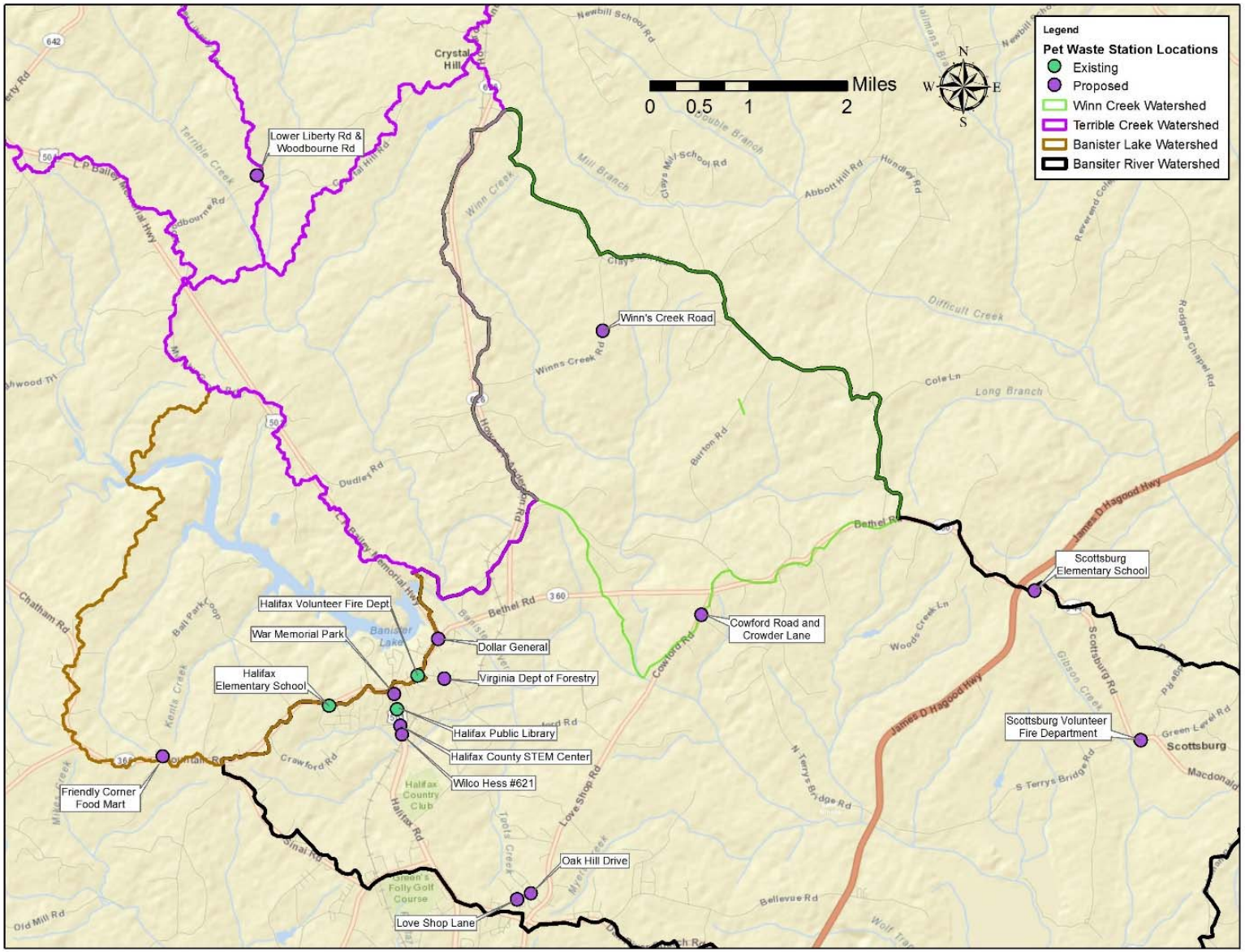

Figure 5-1. Existing and Proposed Pet Waste Stations

Lastly, one pet waste education campaign was proposed for the entire Lower Banister River watershed and tributary watersheds. The campaign would include installation of signage in residential areas reminding citizens to pick up after their pets because of the water quality issues in the watershed, flyers mailed to residents explaining the detrimental effects of not picking up after pets, targeted campaigns at veterinarian clinics and kennels, and outreach through animal control officers and parks and recreational staff.

Table 5-9 details the number of pet waste education campaigns, proposed pet waste stations, and proposed pet waste digesters for each subwatershed.

Table 5-9: Proposed Pet Waste Treatment BMPs

BMP	Lower Banister River	Winn Creek	Terrible Creek	Banister Lake	Total
Pet Waste Education Campaign	Yes	Yes	Yes	Yes	**1**
Pet Waste Station	9	1	1	2	**13**
Pet Waste Digester	107	20	11	8	**146**

5.2.2.3 Stormwater

When it rains, runoff from impervious surfaces (i.e., roads, parking lots, and sidewalks) picks up pollutants including bacteria along the way. Stormwater BMPs consist of practices which mitigate stormwater impacts by filtering and storing stormwater runoff before it reaches the waterbodies. Because not all bacteria from pet waste will be removed by encouraging citizens to pick up after their pets, additional bacteria reductions are addressed by implementing stormwater BMPs. Some BMPs such as rain gardens work on a small scale whereas others such as constructed wetlands, filter stormwater from larger areas. This TMDL IP proposes a selection of stormwater BMPs that primarily focus on Low Impact Development (LID) techniques, which mimic natural hydrology by allowing rainwater to infiltrate/filter/evaporate at the source.

Existing stormwater BMP information was provided by the Town of Halifax to VADEQ. The Town reported two existing stormwater management BMPs within the Banister River watershed that drain approximately 2.56 acres resulting in a bacteria load reduction of 2.00E+10 cfu/year. Reductions in bacteria loads from these existing BMPs were calculated and taken into account during quantification of new proposed BMPs.

Bioretention for Dollar General in Halifax, VA
(Photograph courtesy of Google Maps)

Proposed stormwater BMPs include infiltration basin/trenches, bioretention basins, rain gardens, constructed wetlands, and manufactured BMPs[1] (Table 5-10). Some stormwater BMPs function better when placed on particular soil types. Infiltration basins or trenches perform better on well-draining soil, whereas bioretention basins, manufactured BMPs, and constructed wetlands work better on poorly draining soil. Site-specific analysis would be required prior to the siting, design, and implementation of the BMPs.

The quantification of stormwater BMPs was based on the amount of developed area available for BMP implementation and took into account the appropriateness of the type of BMP by intensity

[1] Manufactured BMPs or manufactured treatment devices (also referred to as *proprietary treatment devices*) consist of commercial products fabricated in manufacturing facilities that provide stormwater pollution treatment. Some examples include hydrodynamic separators and filters. (Source: VA Stormwater BMP Clearinghouse).

of residential land development. Rain gardens were given a greater area to treat than the other stormwater BMPs because much of the development in the watershed is medium and low intensity. Manufactured BMPs were proposed only in the Banister River subwatershed because it is the only subwatershed with high intensity development. The residential bacteria load reduction for Terrible Creek and Banister Lake are primarily addressed through the pet waste education campaign, stations, and digesters but a nominal coverage of stormwater BMPs were included. An urban riparian zone analysis was performed for all streams in developed and residential areas, but it was determined there were no opportunities for riparian zone creation or expansion in these zones because the majority of development is not close to waterways.

Table 5-10: Proposed Stormwater BMPs (Acre-Treated)

BMP	Lower Banister River	Winn Creek	Terrible Creek	Banister Lake	Total
Infiltration Trench	20	2	1	1	**24**
Bioretention	20	2	1	1	**24**
Rain Garden	138	9	1	1	**149**
Constructed Wetland	20	2	1	1	**24**
Manufactured BMP	2	0	0	0	**2**
Total	**200**	**15**	**4**	**4**	**223**

5.3 Outreach Opportunities

Within the Banister River watershed, opportunities to educate the public on the importance of regional water quality and the goals of this TMDL IP include:

- Halifax Earth Day Extravaganza (Spring)
- Banister River and Lake Cleanups (Various)
- Halifax Farmers Market (Seasonal)
- Livestock markets (Year-round)
- Newspapers (Year-round)
- Radio (Year-round)
- Wild Blue River Festival (Fall)
- Halifax County Fair (Fall)

5.4 Technical Assistance

Technical assistance will be necessary beyond what local programs and services currently provide to help the stakeholders implement agricultural, residential, and stormwater BMPs proposed in this plan. Technical assistance includes (1) performing administrative and organizational tasks, (2) providing outreach and education about BMPs and available funding, and (3) assisting with the design and installation of BMPs. Quantification of technical assistance is in Full Time Equivalents (FTEs). Technical assistance for agricultural BMPs would be provided through the Halifax Soil and Water Conservation District (SWCD) and NRCS. Technical assistance for on-site sewage system BMPs could possibly be provided through the SWCD, health department, or regional planning commission, dependent upon available grant funding. In addition, there will be a need for technical assistance for stormwater BMP implementation, which could be handled through a regional planning commission or county government. Below are lists of potential activities associated with technical assistance by program type.

- **Potential technical assistance and educational outreach tasks associated with agricultural programs**
  1. Make contacts with landowners in the watershed to make them aware of implementation goals and cost-share assistance programs.
  2. Provide technical assistance for agricultural programs (e.g., survey, design, layout, and approval of BMP installation).
  3. Administer cost-share assistance and track BMP implementation.
  4. Develop educational materials and programs, based on local needs.
  5. Organize educational programs (e.g., pasture walks, presentations at field days or grazing-club events, etc.).
  6. Distribute educational materials (e.g., informational articles in Farm Service Agency (FSA) or Farm Bureau newsletters, local media, etc.).
  7. Assess progress towards BMP implementation goals.
  8. Follow-up contact with landowners who have installed BMPs.
  9. Coordinate use of existing agricultural programs and suggest modifications where necessary.

- **Potential technical assistance and educational outreach tasks associated with residential programs**

  1. Make contacts with landowners in targeted areas where there are documented problems with on-site sewage systems based on age of homes, poor soils, and high number of repairs and replacements of systems needed based on TMDL IP data.
  2. Track septic system repairs / replacements / installations.
  3. Administer cost-share assistance and track BMP implementation.
  4. Develop educational materials and programs.
  5. Organize educational programs (e.g., demonstration on septic pump-outs).
  6. Distribute educational materials (e.g., informational pamphlets on TMDLs, and on-site sewage disposal systems).
  7. Assess progress toward BMP implementation goals.
  8. Follow-up contact with landowners who have participated in the program(s).

- **Potential technical assistance and educational outreach tasks associated with stormwater BMP implementation**

  1. Make contacts with landowners in the local watersheds to make them aware of implementation goals.
  2. Assist in the identification of grant opportunities and development of grant writing to fund BMP implementation.
  3. Provide assistance for stormwater BMPs (e.g., survey, design, layout, and approval of installation).
  4. Develop educational materials and local workshops on rain barrels, rain gardens, vegetated buffers, turf to trees, etc.
  5. Organize educational programs.
  6. Distribute educational materials.
  7. Assess and track progress toward BMP implementation goals.
  8. Follow-up contact with landowners who have installed BMPs.

A total of one FTE for agricultural BMPs is proposed per year and one FTEs would be necessary for implementation of residential and stormwater BMPs. The FTE is estimated to cost $50,000 per year (based on the established Lower Banister River watershed TMDL IP).

5.5 Costs of Control Measures

The costs for the control measures were derived from multiple sources. Table 5-11 shows the cost of each BMP per system/program, per acre installed, or per acre treated, as well as the cost sources. Costs in Table 5-11 (and subsequent tables) are based on BMP installation and do not include maintenance, unless otherwise noted.

Tables 5-12 through 5-15 present the total costs of all TMDL IP actions for the two implementation stages by subwatershed, grouped by BMP category and type. The Banister Lake subwatershed is not impaired for bacteria, but the proposed measures reflect the source assessment completed for Banister Lake and will improve bacteria conditions in the impaired river segments downstream. Table 5-16 summarizes the costs for the full implementation scenario, including costs associated with technical assistance (which transcends watershed boundaries).

Table 5-11: Best Management Practice Cost			
Agricultural			
BMP Type	**BMP**	**Cost (per system)**	**Reference**
Livestock Exclusion	CREP Livestock Exclusion (CRSL-6)	$26,500	1
	Livestock Exclusion (EQIP)	$20,600	1
	Livestock Exclusion with Grazing Land Management for TMDL IP (SL-6/SL-6T/LE-1T)	$20,600	2
	Small Acreage Grazing System (SL-6AT)	$13,500	1
	Livestock Exclusion with Reduced Setback (LE-2LE-2T)	$14,000	1
	Stream Protection/Fencing (WP-2/WP-2T)	$8,000	1
BMP Type	**BMP**	**Cost (per acre-installed)**	**Reference**
Pasture	Vegetative Cover on Critical Areas (SL-11)	$1,900	2
	Reforestation of Erodible Pasture (FR-1)	$450	1
	Pasture Management (EQIP 528, SL-10T, SL-9)	$75	3
	Wet Detention Ponds for Pastureland (acre-treated)	$150	1
Residential			
BMP Type	**BMP**	**Cost (per system)**	**Reference**
Waste Treatment	Septic System Pump-Out (RB-1)	$200	1
	Sewer Connection (RB-2)	$3,200	1
	Repaired Septic System (RB-3)	$3,000	1
	Septic System Installation/Replacement (RB-4)	$6,000	1
	Septic System Installation/Replacement with Pump (RB-4P)	$8,000	1
	Alternative Waste Treatment System Installation (RB-5)	$15,000	1
Pet Waste	Pet Waste Digester	$50	4
	Pet Waste Education Campaign	$5,000	1
	Pet Waste Station[1]	$4,070	5
BMP Type	**BMP**	**Cost (per acre-treated)**	**Reference**
Stormwater	Infiltration Trench	$11,300	1
	Bioretention	$15,000	1
	Rain Garden	$5,000	6
	Constructed Wetland	$2,900	7
	Manufactured BMP	$20,000	8

[1]Cost includes initial unit and five years' worth of bag and trash can liner refills.

References (right column in table):

1. VADEQ. 2012.
2. VADCR. 2013b. Average of reported cost for Banister River Watershed BMPs.
3. NRCS and VADCR incentive-based practices.
4. Pet Solutions Website (*http://www.petsolutions.com/C/Dog-Lawn-Care/I/Doggie-Dooley-Model-3000.aspx*)
5. James River Association. 2013.
6. VADCR. 2006.
7. Schueler, et al. 2007.
8. VADCR. 2013a.

Table 5-12: Lower Banister River TMDL IP BMP and Cost Summary				
Agricultural				
BMP Type	**BMP**	**Cost (per system)**	**Systems**	**Total Cost**
Livestock Exclusion	CREP Livestock Exclusion (CRSL-6)	$26,500	4	$106,000
	Livestock Exclusion (EQIP)	$20,600	7	$144,200
	Livestock Exclusion with Grazing Land Management for TMDL IP (SL-6/SL-6T/LE-1T)	$20,600	27	$556,200
	Small Acreage Grazing System (SL-6AT)	$13,500	1	$13,500
	Livestock Exclusion with Reduced Setback (LE-2/LE-2T)	$14,000	3	$42,000
	Stream Protection/Fencing (WP-2/WP-2T)	$8,000	3	$24,000
BMP Type	**BMP**	**Cost (per acre installed)**	**Acre-Installed**	**Total Cost**
Pasture	Vegetative Cover on Critical Areas (SL-11)	$1,900	508	$965,200
	Reforestation of Erodible Pasture (FR-1)	$450	267	$120,150
	Pasture Management (EQIP 528, SL-10T, SL-9)	$75	5,077	$380,775
Residential				
BMP Type	**BMP**	**Cost (per system)**	**Systems**	**Total Cost**
Waste Treatment	Septic System Pump-Out (RB-1)	$200	150	$30,000
	Sewer Connection (RB-2)	$3,200	4	$12,800
	Repaired Septic System (RB-3)	$3,000	41	$123,000
	Septic System Installation/Replacement (RB-4)	$6,000	15	$90,000
	Septic System Installation/Replacement with Pump (RB-4P)	$8,000	2	$16,000
	Alternative Waste Treatment System Installation (RB-5)	$15,000	1	$15,000
Pet Waste	Pet Waste Education Campaign	$5,000	1[b]	$5,000[b]
	Pet Waste Station[a]	$4,070	9	$36,630
	Pet Waste Digester	$100	107	$10,700
BMP Type	**BMP**	**Cost (per acre-treated)**	**Acre-Treated**	**Total Cost**
Stormwater	Infiltration Trench	$11,300	20	$226,000
	Bioretention	$15,000	20	$300,000
	Rain Garden	$5,000	138	$690,000
	Constructed Wetland	$2,900	20	$58,000
	Manufactured BMP	$20,000	2	$40,000
Total Subwatershed TMDL IP Cost				**$4,005,155**

[a] Includes bag replacements for five years.

[b] One pet waste education campaign for the entire Lower Banister River watershed and tributary watersheds.

Table 5-13: Winn Creek TMDL IP BMP and Cost Summary				
Agricultural				
BMP Type	**BMP**	**Cost (per system)**	**Systems**	**Total Cost**
Livestock Exclusion	CREP Livestock Exclusion (CRSL-6)	$26,500	1	$26,500
	Livestock Exclusion (EQIP)	$20,600	2	$41,200
	Livestock Exclusion with Grazing Land Management for TMDL IP (SL-6/SL-6T/LE-1T)	$20,600	7	$144,200
	Small Acreage Grazing System (SL-6AT)	$13,500	-	-
	Livestock Exclusion with Reduced Setback (LE-2/LE-2T)	$14,000	1	$14,000
	Stream Protection/Fencing (WP-2/WP-2T)	$8,000	-	-
BMP Type	**BMP**	**Cost (per acre installed)**	**Acre-Installed**	**Total Cost**
Pasture	Vegetative Cover on Critical Areas (SL-11)	$1,900	231	$438,900
	Reforestation of Erodible Pasture (FR-1)	$450	122	$54,900
	Pasture Management (EQIP 528, SL-10T, SL-9)	$75	2,315	$173,625
	Wet Detention Ponds for Pastureland (acre-treated)	$150	375	$56,250
Residential				
BMP Type	**BMP**	**Cost (per system)**	**Systems**	**Total Cost**
Waste Treatment	Septic System Pump-Out (RB-1)	$200	28	$5,600
	Sewer Connection (RB-2)	$3,200	0	$0
	Repaired Septic System (RB-3)	$3,000	7	$21,000
	Septic System Installation/Replacement (RB-4)	$6,000	3	$18,000
	Septic System Installation/Replacement with Pump (RB-4P)	$8,000	1	$8,000
	Alternative Waste Treatment System Installation (RB-5)	$15,000	1	$15,000
Pet Waste	Pet Waste Education Campaign	$5,000	See Lower Banister River	
	Pet Waste Station[a]	$4,070	1	$4,070
	Pet Waste Digester	$50	20	$1,000
BMP Type	**BMP**	**Cost (per acre-treated)**	**Acre-Treated**	**Total Cost**
Stormwater	Infiltration Trench	$11,300	2	$22,600
	Bioretention	$15,000	2	$30,000
	Rain Garden	$5,000	9	$45,000
	Constructed Wetland	$2,900	2	$5,800
	Manufactured BMP	$20,000	0	$0
Total Subwatershed TMDL IP Cost				**$1,125,645**

[a] Includes bag replacements for five years.

Table 5-14: Terrible Creek TMDL IP BMP and Cost Summary				
Agricultural				
BMP Type	**BMP**	**Cost (per system)**	**Systems**	**Total Cost**
Livestock Exclusion	CREP Livestock Exclusion (CRSL-6)	$26,500	6	$159,000
	Livestock Exclusion (EQIP)	$20,600	9	$185,400
	Livestock Exclusion with Grazing Land Management for TMDL IP (SL-6/SL-6T/LE-1T)	$20,600	34	$700,400
	Small Acreage Grazing System (SL-6AT)	$13,500	1	$13,500
	Livestock Exclusion with Reduced Setback (LE-2/LE-2T)	$14,000	4	$56,000
	Stream Protection/Fencing (WP-2/WP-2T)	$8,000	3	$24,000
BMP Type	**BMP**	**Cost (per acre installed)**	**Acre-Installed**	**Total Cost**
Pasture	Vegetative Cover on Critical Areas (SL-11)	$1,900	297	$564,300
	Reforestation of Erodible Pasture (FR-1)	$450	312	$140,400
	Pasture Management (EQIP 528, SL-10T, SL-9)	$75	2,817	$211,275
	Wet Detention Ponds for Pastureland (acre-treated)	-	-	-
Residential				
BMP Type	**BMP**	**Cost (per system)**	**Systems**	**Total Cost**
Waste Treatment	Septic System Pump-Out (RB-1)	$200	47	$9,400
	Sewer Connection (RB-2)	$3,200	0	$0
	Repaired Septic System (RB-3)	$3,000	13	$39,000
	Septic System Installation/Replacement (RB-4)	$6,000	5	$30,000
	Septic System Installation/Replacement with Pump (RB-4P)	$8,000	1	$8,000
	Alternative Waste Treatment System Installation (RB-5)	$15,000	1	$15,000
Pet Waste	Pet Waste Education Campaign	$5,000	See Lower Banister River	
	Pet Waste Station[a]	$4,070	1	$4,070
	Pet Waste Digester	$50	11	$550
BMP Type	**BMP**	**Cost (per acre-treated)**	**Acre-Treated**	**Total Cost**
Stormwater	Infiltration Trench	$11,300	1	$11,300
	Bioretention	$15,000	1	$15,000
	Rain Garden	$5,000	1	$5,000
	Constructed Wetland	$2,900	1	$2,900
	Manufactured BMP	-	0	-
Total Subwatershed TMDL IP Cost				**$2,194,495**

[a] Includes bag replacements for five years.

Table 5-15: Banister Lake TMDL IP BMP and Cost Summary				
Agricultural				
BMP Type	**BMP**	**Cost (per system)**	**Systems**	**Total Cost**
Livestock Exclusion	CREP Livestock Exclusion (CRSL-6)	$26,500	1	$26,500
	Livestock Exclusion (EQIP)	$20,600	2	$41,200
	Livestock Exclusion with Grazing Land Management for TMDL IP (SL-6/SL-6T/LE-1T)	$20,600	7	$144,200
	Small Acreage Grazing System (SL-6AT)	$13,500	0	$0
	Livestock Exclusion with Reduced Setback (LE-2/LE-2T)	$14,000	1	$14,000
	Stream Protection/Fencing (WP-2/WP-2T)	$8,000	1	$8,000
BMP Type	**BMP**	**Cost (per acre installed)**	**Acre-Installed**	**Total Cost**
Pasture	Vegetative Cover on Critical Areas (SL-11)	$1,900	44	$92,400
	Reforestation of Erodible Pasture (FR-1)	$450	47	$21,150
	Pasture Management (EQIP 528, SL-10T, SL-9)	$75	443	$33,225
	Wet Detention Ponds for Pastureland (acre-treated)	-	-	-
Residential				
BMP Type	**BMP**	**Cost (per system)**	**Systems**	**Total Cost**
Waste Treatment	Septic System Pump-Out (RB-1)	$200	33	$6,600
	Sewer Connection (RB-2)	$3,200	4	$12,800
	Repaired Septic System (RB-3)	$3,000	6	$18,000
	Septic System Installation/Replacement (RB-4)	$6,000	2	$12,000
	Septic System Installation/Replacement with Pump (RB-4P)	$8,000	1	$8,000
	Alternative Waste Treatment System Installation (RB-5)	$15,000	1	$15,000
Pet Waste	Pet Waste Education Campaign	$5,000	See Lower Banister River	
	Pet Waste Station[a]	$4,070	2	$8,140
	Pet Waste Digester	$50	8	$400
BMP Type	**BMP**	**Cost (per acre-treated)**	**Acre-Treated**	**Total Cost**
Stormwater	Infiltration Trench	$11,300	1	$11,300
	Bioretention	$15,000	1	$15,000
	Rain Garden	$5,000	1	$5,000
	Constructed Wetland	$2,900	1	$2,900
	Manufactured BMP	-	0	-
Total Subwatershed TMDL IP Cost				**$487,015**

[a] Includes bag replacements for five years.

Table 5-16: Summary of Cost of Lower Banister River, Winn Creek, and Terrible Creek TMDL IP by Subwatershed

Watershed	Agricultural BMPs	Residential BMPs	Total
Banister River	$2,352,025	$1,653,130	$4,185,155
Winn Creek	$949,575	$176,070	$1,125,645
Terrible Creek	$2,054,275	$140,220	$2,194,495
Banister Lake	$371,875	$115,140	$487,015
Subtotals	**$5,727,750**	**$2,084,560**	**$7,812,310**
Technical Assistance			$1,000,000
		Total Cost	**$8,812,310**

5.6 Benefits of Control Measures

The ultimate goal of this Lower Banister River, Winn Creek, and Terrible Creek TMDL IP is to meet water quality standards that support human recreational use and aquatic life. Successful pollutant reductions through BMPs and educational programs would allow the impaired segments to be delisted and eventually achieve the bacteria allocations in the TMDLs. The main benefit of implementation of the various control measures is the improvement of the water quality of the lower Banister River and its tributaries. Benefits are derived not only from the resulting clean water but also directly from the actual control measures themselves. Enhanced natural resources also provide for enriched recreational opportunities. Reducing bacteria loads in the watershed will protect human health and safety, promote healthy aquatic communities, improve agricultural production, and add to the economic vitality of communities.

Human Health and Safety

Human, livestock, and wildlife waste can carry viruses and bacteria that are harmful to human health. Although the full range of effects from reduced bacteria loadings on public health is uncertain, the improved water quality should, at the very least, reduce the incidence of infection derived from contact with surface waters (VADCR, 2003). Throughout the United States, the Center for Disease Control (CDC) estimates that at least 73,000 cases of illnesses and 61 deaths per year are caused by *E. coli* 0157:H7 bacteria (CDC, 2001). Other fecal pathogens (e.g., *E. coli* 0111) are responsible for similar illnesses. Reducing the presence of bacteria in the watershed should considerably reduce the chances of infection from *E. coli* sources through contact with surface waters in tributary streams and the Banister River. In addition to preventing infection and

disease, strategies in this plan addressing stormwater could help mitigate and prevent future flooding.

Agricultural Production

This plan recognizes that each and every farmer faces their own unique management challenges. Thus, some of the BMPs in this plan may be more suitable and more cost-effective for one landowner than for another in the watershed. Similarly, the benefits of implementing these practices will vary, but can be estimated based on general research.

Restricting cattle access to streams and providing them with a clean water source can improve weight gain (Surber et al., 2005; Wilms et al., 1994)). Increasing weight associated with drinking from a cleaner source of water can translate into economic gains for producers as shown in Table 5-17, taken from Zeckoski et al. (2007). Additionally, keeping cattle in clean, dry areas has been shown to reduce the occurrence of *mastitis* and foot rot. The Virginia Cooperative Extension estimates *mastitis* costs producers $150 per cow in reduced milk production quantity and quality (Jones and Balley, 2009).

Table 5-17: Production gains associated with provision of clean water for cattle*

Typical calf sale weight	Additional weight gain with access to clean water	Price	Increased revenue
500 lb/calf	5% (25lb)	$0.60/lb	$15/calf

*Surber et al., 2005

Taking the opportunity to implement an improved pasture management system in conjunction with installing clean water supplies would also provide economic benefits for the producer. Improved pasture management can allow a producer to feed less hay in winter months, increase stocking rates by 30 to 40% and, consequently, improve the profitability of the operation. With feed costs typically responsible for 70 to 80% of the cost of growing or maintaining an animal, and pastures providing feed at a cost of 0.01 to 0.02 cents/lb of total digestible nutrients (TDN) compared to 0.04 to 0.06 cents/lb TDN for hay, increasing the amount of time that cattle are fed on pasture is clearly a financial benefit to producers (VCE, 1996). Standing forage utilized directly by the grazing animal is always less costly and of higher quality than the same forage harvested with equipment and fed to the animal. In addition to reducing costs to producers, intensive pasture management can boost profits by allowing higher stocking rates and increasing the amount of gain

per acre. Another benefit is that cattle are closely confined allowing for quicker examination and handling. In summary, many of the agricultural BMPs recommended in this document would provide both environmental and economic benefits to the farmer.

Improvements to Residential Properties

Individual homeowners and residents could also benefits from these efforts. Implementation activities in the plan provide homeowners with knowledge and tools needed for properly maintaining and extending the life of their septic systems. The overall cost of ownership could also be reduced by advocating regular pump outs which cost about $300 compared to the $3,000-$25,000 cost of a repair or replacement system. The additional services provided by new stormwater BMPs could raise the market value of nearby homes by 0 to 5% (Braden and Johnston, 2004). Another study in the Chesapeake Bay area found that lower fecal coliform concentrations correlates with increased property values (Leggett and Bockstael, 2000).

Economic Benefits of Stormwater BMPs

Stormwater BMPs can be incorporated into a landscape design as an amenity both on private and public properties. Many BMPs like vegetated swales, buffer strips, and infiltration trenches are inexpensive and easy to implement given limited space and other constraints. Installation of stormwater BMPs provide educational opportunities to increase awareness of water quality strategies (i.e., watershed plans) and green initiatives.

Potential economic benefits of stormwater BMPs (Wise, 2007):

- Incremental implementation and funding (can result in less debt service)
- Less capital-intensive and may have overall lower costs
- Can extend existing capacity of current infrastructure
- Enhance the asset values of clean water, soil capacity and open space amenities, which provide ecosystem services
- Reduce wastewater and water treatment costs
- Increased property values to the benefits of the private sector and public revenue collection.

Stormwater infrastructure that reduces stormwater runoff onsite can reduce losses from flood damage by $6,700 to $9,700 per acre (Medina et al., 2011). Urban stormwater BMPs can also

help increase stormwater retention and lower peak discharges, thereby reducing the pressure on and need for stormwater infrastructure. This will in turn lower costs for engineering, land acquisition, and materials for municipalities and private enterprises.

Community Economic Vitality

Not only will clean water and improved habitats benefit a landowner that earns their livelihood through their land but it will also benefit the overall regional economy by encouraging outdoor pursuits that stimulate the local economy and employment such as fishing, canoeing, kayaking, hiking, and other recreational tourism.

Healthy watersheds provide many ecosystem services necessary for a community's well-being. These services include, but are not limited to, water filtration and storage, air filtration, carbon storage, energy, nutrient cycling, removal of pollutants, soil formation, recreation, food and timber. Many of these services are hard to quantify in terms of dollars and are often undervalued (Bockstael et al., 2000). However, it is understood that many of these services are difficult to replace and often expensive to artificially engineer. Efforts to restore the Banister River watershed to a healthier state may reduce the financial burden on residents, businesses, and municipalities who currently bear the cost of damages caused by a degraded aquatic system such as flooding. Lastly, the combined economic and natural resource benefits provide for a better quality of life for local and regional residents now and in the future.

With the completed TMDL IP, organizations in the watershed will be eligible to apply for competitive funding to help cover some of the costs associated with installing the BMPs. These potential funds along with matching funds from other sources would benefit many local contractors involved in the repair and installation of septic systems, building of livestock exclusion systems, and installation of stormwater BMPs. In a 2009 study, researchers estimated that every $1 million invested in environmental efforts such as reforestation, land and watershed restoration, and sustainable forest management, would create approximately 39 jobs (Heintz et al., 2009). Economic benefits to the region and individual stakeholders are an indirect result of the TMDL IP. Improvement of water quality provides greater economic opportunities throughout the area.

6.0 Measurable Goals and Milestones for Attaining Water Quality Standards

The primary goals of the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP are to restore water quality in the impaired waterbodies and subsequently de-list the impaired segments from the Virginia 303(d) List of Impaired Waters for bacteria impairments. This section will outline specific implementation milestones, water quality milestones, the link between implementation and water quality improvement, provide a timeline for implementation, and describe additional tracking and monitoring to measure implementation of achievements.

6.1 Milestone Identification

Expected progress in implementation is established with two types of milestones: *implementation milestones* and *water quality milestones*. Implementation milestones establish the amount of control measures installed within prescribed timeframes, while water quality milestones establish the corresponding improvements in water quality that can be expected as the implementation milestones are met. The implementation of control measures proposed in the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP will take place over two stages in a ten year timeline.

The first stage focuses on implementing the more cost-effective and commonly implemented actions such as livestock exclusion practices, some pasture BMPs, and septic system repairs which should reach the delisting goal. The second stage goal, while implementing the remainder of the more expensive BMPs, is to achieve reductions set by the TMDLs. The IP addresses implementation actions to reduce the man-induced sources of bacteria and does not specifically address wildlife reductions both direct and indirect in the TMDLs. Reductions in the indirect wildlife loads are obtained from BMPs implemented on pasture, hay and residential lands to address the anthropogenic bacteria loads on these land uses. The exceedances of the geometric mean and single sample maximum are the lowest violation percentage obtainable once the anthropogenic sources of bacteria are addressed through maximum extent practicable implementation without eliminating direct wildlife loads to the creek.

Tables 6-1 to 6-4 present the two stages for each subwatershed with specific control measures distributed in each stage. Actions listed in each stage are cumulative in nature, and there are place-markers for the later stages to mark when the extent of proposed BMP implementation has been accomplished in a previous stage.

Implementation milestones establish the amount of control measures installed within prescribed timeframes, while water quality milestones establish the corresponding improvements in water quality that can be expected as the implementation milestones are met.

One of the goals of the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP is to link the implementation of control measures to corresponding improvements in water quality. These improvements in water quality of the impaired segments can be determined through bacteria modeling. The HSPF model was used to determine the percent exceedance of the geometric and single sample maximum water quality criterion for each stage (or milestone) for each subwatershed. Since Banister Lake is not impaired, the watershed does not have water quality milestones to meet, but implementation milestones are shown (Table 6-4). The modeling shows that the BMPs proposed will reduce bacteria so that water quality standards begin to be met and the stream can be delisted from the impaired waters list.

Table 6-1: Lower Banister River TMDL IP Summary				
Agricultural				
BMP Type	**BMP**	Unit	Stage I (Y1-Y6) Delisting Stage	Stage II (Y7-Y10) TMDL Allocations
Livestock Exclusion	CREP Livestock Exclusion (CRSL-6)	System	4	-
	Livestock Exclusion (EQIP)	System	7	-
	Livestock Exclusion with Grazing Land Management for TMDL IP (SL-6/SL-6T/LE-1T)	System	27	-
	Small Acreage Grazing System (SL-6AT)	System	1	-
	Livestock Exclusion with Reduced Setback (LE-2/LE-2T)	System	3	-
	Stream Protection/Fencing (WP-2/WP-2T)	System	3	-
		Total Cost	$885,900	-
Pasture	Vegetative Cover on Critical Areas (SL-11)	Acre Installed	305	203
	Reforestation of Erodible Pasture (FR-1)	Acre Installed	160	107
	Pasture Management (EQIP 528, SL-10T)	Acre Installed	2,539	2,538
		Total Cost	$841,925	$624,200
Residential				
On-site Sewage Systems	Septic System Pump-Out (RB-1)	Pump-Out	150	-
	Sewer Connection (Targeted Areas and RB-2)	System	4	-
	Repaired Septic System (RB-3)	System	41	-
	Septic System Installation/Replacement (RB-4)	System	15	-
	Septic System Installation/Replacement with Pump (RB-4P)	System	2	-
	Alternative Waste Treatment System Installation (RB-5)	System	1	-
		Total Cost	$286,800	
Pet Waste	Pet Waste Education Campaign	Program	1	-
	Pet Waste Station	Unit	4	5
	Pet Waste Digester	Unit	25	82
		Total Cost	$23,780	$28,550
Urban				
Stormwater	Infiltration Trench	Acre Treated	2.0	18.0
	Bioretention	Acre Treated	2.0	18.0
	Rain Gardens	Acre Treated	13.8	124.2
	Constructed Wetland	Acre Treated	2.0	18.0
	Manufactured BMP	Acre Treated		2.0
		Total Cost	$127,400	$1,186,600
		Total Cost Per Stage	**$2,165,805**	**$1,839,350**
		Percent Exceedance Geometric Mean (200 cfu/100 mL)	15%	15%
		Percent Exceedance Single Sample Maximum (400 cfu/100mL)	10%	9%

Table 6-2: Winn Creek TMDL IP Summary				
Agricultural				
BMP Type	**BMP**	Unit	Stage I (Y1-Y6) Delisting Stage	Stage II (Y7-Y10) TMDL Allocations
Livestock Exclusion	CREP Livestock Exclusion (CRSL-6)	System	1	-
	Livestock Exclusion (EQIP)	System	2	-
	Livestock Exclusion with Grazing Land Management for TMDL IP (SL-6/SL-6T/LE-1T)	System	7	-
	Small Acreage Grazing System (SL-6AT)	System	-	-
	Livestock Exclusion with Reduced Setback (LE-2/LE-2T)	System	1	-
	Stream Protection/Fencing (WP-2/WP-2T)	System	-	-
		Total Cost	$225,900	-
Pasture	Vegetative Cover on Critical Areas (SL-11)	Acre Installed	139	93
	Reforestation of Erodible Pasture (FR-1)	Acre Installed	73	49
	Pasture Management (EQIP 528, SL-10T)	Acre Installed	1,158	1,158
	Wet Detention Ponds for Pastureland	Acres Treated	-	375
		Total Cost	$383,763	$341,813
Residential				
On-site Sewage Systems	Septic System Pump-Out (RB-1)	Pump-Out	28	-
	Sewer Connection (Targeted Areas and RB-2)	System	-	-
	Repaired Septic System (RB-3)	System	7	-
	Septic System Installation/Replacement (RB-4)	System	3	-
	Septic System Installation/Replacement with Pump (RB-4P)	System	1	-
	Alternative Waste Treatment System Installation (RB-5)	System	1	-
		Total Cost	$67,600	
Pet Waste	Pet Waste Education Campaign	Program	1	-
	Pet Waste Station	Unit	1	-
	Pet Waste Digester	Unit	20	-
		Total Cost	$5,070	-
Urban				
Stormwater	Infiltration Trench	Acre Treated	1.0	1.0
	Bioretention	Acre Treated	1.0	1.0
	Rain Gardens	Acre Treated	4.5	4.5
	Constructed Wetland	Acre Treated	1.0	1.0
		Total Cost	$51,700	$51,700
		Total Cost Per Stage	**$734,033**	**$393,513**
		Percent Exceedance Geometric Mean (126 cfu/100 mL)	4%	1%
		Percent Exceedance Single Sample Maximum (235 cfu/100mL)	12%	10%

Table 6-3: Terrible Creek TMDL IP Summary				
Agricultural				
BMP Type	**BMP**	Unit	Stage I (Y1-Y6) Delisting Stage	Stage II (Y7-Y10) TMDL Allocations
Livestock Exclusion	CREP Livestock Exclusion (CRSL-6)	System	6	-
	Livestock Exclusion (EQIP)	System	9	-
	Livestock Exclusion with Grazing Land Management for TMDL IP (SL-6/SL-6T/LE-1T)	System	34	-
	Small Acreage Grazing System (SL-6AT)	System	1	-
	Livestock Exclusion with Reduced Setback (LE-2/LE-2T)	System	4	-
	Stream Protection/Fencing (WP-2/WP-2T)	System	3	-
		Total Cost	$1,138,300	-
Pasture	Vegetative Cover on Critical Areas (SL-11)	Acre Installed	178	119
	Reforestation of Erodible Pasture (FR-1)	Acre Installed	187	125
	Pasture Management (EQIP 528, SL-10T)	Acre Installed	1,409	1,409
		Total Cost	$527,988	$387,988
Residential				
On-site Sewage Systems	Septic System Pump-Out (RB-1)	Pump-Out	47	-
	Sewer Connection (Targeted Areas and RB-2)	System	0	-
	Repaired Septic System (RB-3)	System	12	-
	Septic System Installation/Replacement (RB-4)	System	5	-
	Septic System Installation/Replacement with Pump (RB-4P)	System	1	-
	Alternative Waste Treatment System Installation (RB-5)	System	1	-
		Total Cost	$98,400	
Pet Waste	Pet Waste Education Campaign	Program	1	-
	Pet Waste Station	Unit	1	-
	Pet Waste Digester	Unit	11	-
		Total Cost	$4,620	-
Urban				
Stormwater	Infiltration Trench	Acre Treated	1	
	Bioretention	Acre Treated	1	
	Rain Gardens	Acre Treated	1	
	Constructed Wetland	Acre Treated	1	
		Total Cost	$34,200	
		Total Cost Per Stage	**$1,803,508**	**$387,988**
		Percent Exceedance Geometric Mean (126 cfu/100 mL)	0%	0%
		Percent Exceedance Single Sample Maximum (235 cfu/100mL)	6%	5%

Table 6-4: Banister Lake TMDL IP Summary				
Agricultural				
BMP Type	**BMP**	Unit	Stage I (Y1-Y6) Delisting Stage	Stage II (Y7-Y10) TMDL Allocations
Livestock Exclusion	CREP Livestock Exclusion (CRSL-6)	System	1	-
	Livestock Exclusion (EQIP)	System	2	-
	Livestock Exclusion with Grazing Land Management for TMDL IP (SL-6/SL-6T/LE-1T)	System	7	-
	Small Acreage Grazing System (SL-6AT)	System	0	-
	Livestock Exclusion with Reduced Setback (LE-2/LE-2T)	System	1	-
	Stream Protection/Fencing (WP-2/WP-2T)	System	1	-
		Total Cost	$233,900	-
Pasture	Vegetative Cover on Critical Areas (SL-11)	Acre Installed	10	33
	Reforestation of Erodible Pasture (FR-1)	Acre Installed	10	35
	Pasture Management (EQIP 528, SL-10T)	Acre Installed	221	221
		Total Cost	$40,075	$95,025
Residential				
On-site Sewage Systems	Septic System Pump-Out (RB-1)	Pump-Out	33	-
	Sewer Connection (Targeted Areas and RB-2)	System	2	-
	Repaired Septic System (RB-3)	System	7	-
	Septic System Installation/Replacement (RB-4)	System	2	-
	Septic System Installation/Replacement with Pump (RB-4P)	System	1	-
	Alternative Waste Treatment System Installation (RB-5)	System	1	-
		Total Cost	$69,000	
Pet Waste	Pet Waste Education Campaign	Program	1	-
	Pet Waste Station	Unit	1	-
	Pet Waste Digester	Unit	2	-
		Total Cost	$8,540	-
Urban				
Stormwater	Infiltration Trench	Acre Treated		1.0
	Bioretention	Acre Treated		1.0
	Rain Gardens	Acre Treated		1.0
	Constructed Wetland	Acre Treated		1.0
		Total Cost		$34,200
		Total Cost Per Stage	**$351,515**	**$129,225**

6.2 Targeting

Targeting more specific locations for BMP implementation is part of staged implementation. In order to use sometimes limited resources in the most effective manner, targeting smaller areas for BMP implementation, other than on the subwatershed level, can prove useful. To do this, the model segments used in the original TMDL development (Figure 6-1) were ranked based on different criteria for stakeholders to use as a guide in the implementation process.

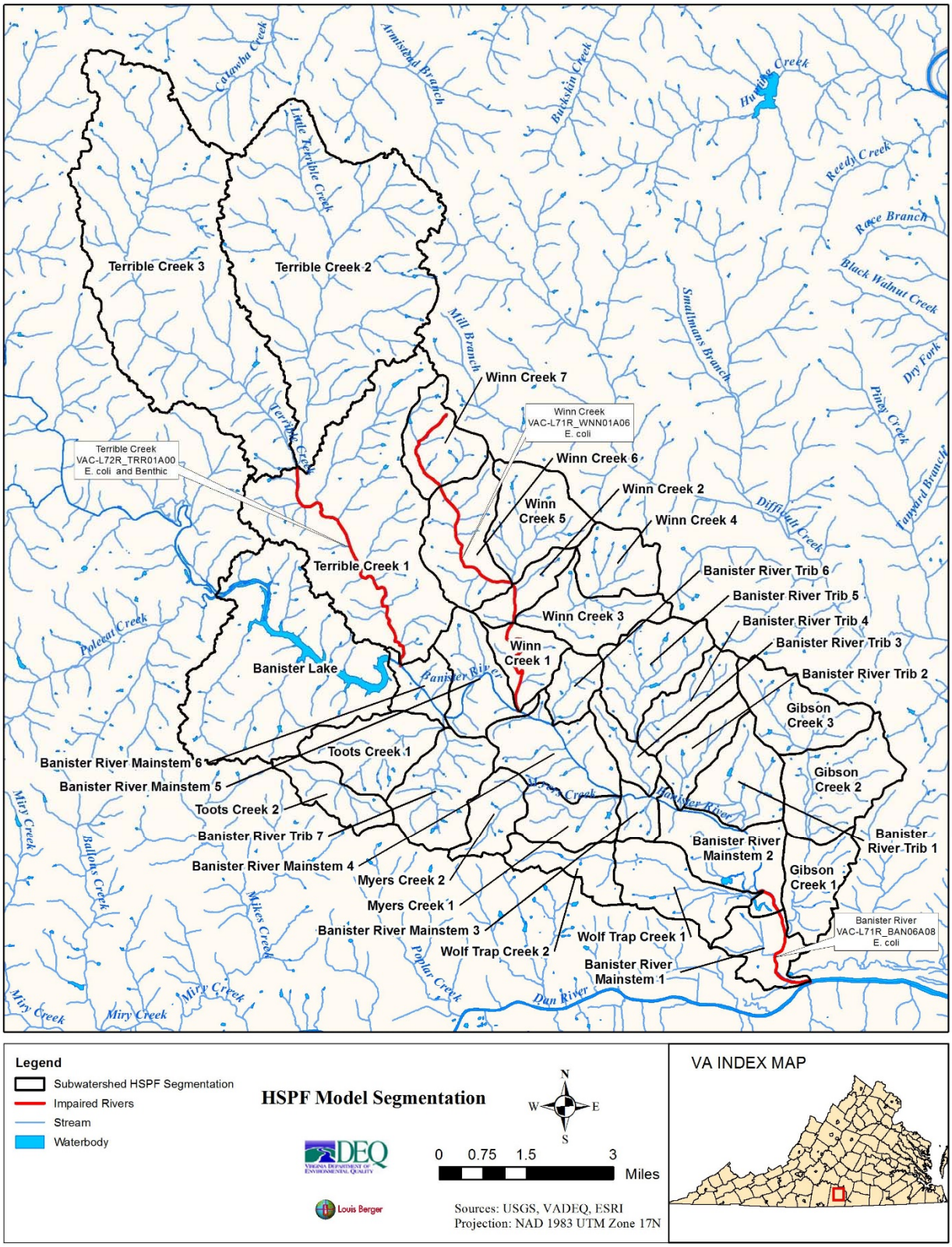

Figure 6-1: HSPF Modeling Segments for the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP

The first ranking of the subwatersheds was on residential on-site sewage disposal. The ranks were derived from the number of failing septic systems to be corrected in each model segment (Table 6-5). Banister Lake was not included in the targeting as it is not currently impaired.

Table 6-5: Targeting of Priority Subwatersheds for Residential On-Site Sewage Disposal BMPs

Model Segment	Rank
Banister River Trib 7	1
Toots Creek 1	2
Terrible Creek 1	3
Terrible Creek 2	4
Terrible Creek 3	5
Myers Creek 2	6
Toots Creek 2	7
Winn Creek 3	8
Gibson Creek 3	9
Winn Creek 1	10
Banister River Trib 5	11
Banister River Mainstem 6	12
Banister River Trib 6	13
Winn Creek 5	14
Winn Creek 6	15
Banister River Mainstem 4	16
Gibson Creek 2	17
Wolf Trap Creek 2	18
Wolf Trap Creek 1	19
Myers Creek 1	20
Banister River Mainstem 5	21
Banister River Trib 3	22
Banister River Trib 4	23
Banister River Mainstem 3	24
Banister River Trib 2	25
Winn Creek 7	26
Winn Creek 4	27
Gibson Creek 1	28
Winn Creek 2	29
Banister River Mainstem 2	30
Banister River Mainstem 1	31
Banister River Trib 1	32

Livestock exclusion practices are another spatially calculated BMP which lends itself to targeting, and is highly effective at removing bacteria from streams. Table 6-6 ranks each model segment by the total length of livestock stream fencing proposed for these model segments; Figure 6-2 shows the potential stream segments which would need installation of livestock stream fencing. Banister Lake was not included in the targeting as it is not currently impaired.

Table 6-6: Targeting of Priority Subwatersheds for Livestock Exclusion BMPs

Model Segment	Rank
Terrible Creek 3	1
Terrible Creek 2	2
Gibson Creek 2	3
Banister River Trib 5	4
Banister River Mainstem 5	5
Banister River Trib 3	6
Terrible Creek 1	7
Winn Creek 1	8
Banister River Trib 2	9
Gibson Creek 3	10
Winn Creek 5	11
Winn Creek 7	12
Myers Creek 1	13
Banister River Mainstem 3	14
Winn Creek 4	15
Banister River Mainstem 4	16
Banister River Mainstem 2	17
Banister River Trib 7	18
Winn Creek 3	19
Winn Creek 6	20
Banister River Trib 4	21
Wolf Trap Creek 1	22
Banister River Mainstem 6	23

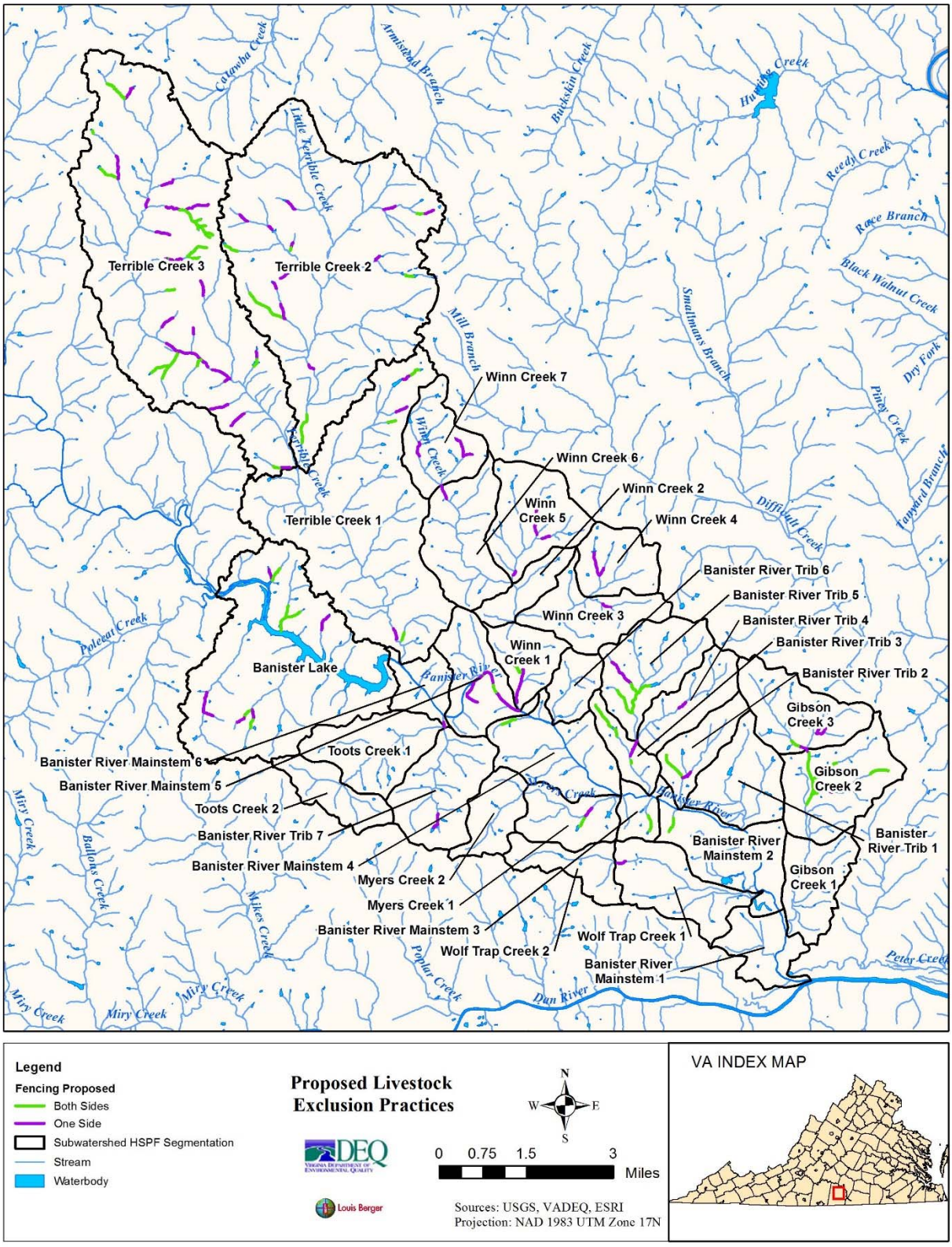

Figure 6-2: Proposed Livestock Exclusion by Segment for Lower Banister River, Winn Creek, and Terrible Creek TMDL IP

6.3 Reasonable Assurance

A big portion of the TMDL IP process is to solicit information and vet proposed BMPs, educational programs, and the experiences of the stakeholders. Many of the actions are voluntary, so buy-in from the public is crucial to the success of the watershed IP. During the entire TMDL IP process, the major stakeholders and a variety of local conservation agency personnel participated in public meetings, working groups and steering committees. They provided feedback in-person and through emails, and information specific to their fields in regards to BMPs proposed. The high level of participation and diverse group of stakeholders provide reasonable assurance that the public contributed to and influenced the selection of implementation practices proposed in this TMDL IP.

6.4 Implementation Tracking

Implementation actions should be tracked to ensure that BMPs are adequately installed and maintained. Implementation tracking involves inventorying the locations and numbers of BMPs put into place within the watershed and will be used to evaluate changes in the watershed. BMP tracking will include the quantification of the various BMPs identified in the IP and reporting the applicable units that are installed in each subwatershed. Management measures, such as types of outreach education activities (e.g., workshops, mailings, field days) and number of participants, should also be tracked. The agricultural practices that are state cost-shared will be tracked through the Halifax Soil and Water Conservation District and be part of the Virginia Agricultural Cost-share Database, administered by VADCR. Tracking of stormwater BMPs will occur on a municipality level. BMPs installed through various grant programs (e.g. Section 319) will be tracked in accordance to grant reporting requirements. A subset of the TMDL IP steering committee should reconvene and collaborate on implementation tracking at key points throughout the implementation timeline.

6.5 Monitoring Plan

In order to evaluate progress toward meeting water quality milestones, monitoring the water quality of the impaired watersheds will occur throughout the timeline of the TMDL IP. Monitoring will also show the progress made from implementing the BMPs proposed in this plan. Since the primary goal of the TMDL IP is to de-list the impaired segments for bacteria, VADEQ will focus

its monitoring efforts on the original listing stations for the bacteria impairments (Table 6-7; Figure 6-3). VADEQ supported monitoring will occur at these and/or additional stations in the IP area after a period of at least 2 years of implementation project installation in a particular subwatershed (to allow for the effectiveness of BMPs to be in place). Key stakeholders may convene with VADEQ to discuss monitoring start times and implementation activities. Monitoring at bacteria and water chemistry stations will occur on a bi-monthly cycle. If VADEQ is unable to de-list the impaired segments in this plan for bacteria using these timeframes, additional monitoring may be scheduled.

Table 6-7: Bacteria Monitoring Stations in the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP

Station ID	Stream Name
4ABAN001.86	Banister River
4ABAN002.67	Banister River
4ABAN005.58	Banister River
4ABAN008.30	Banister River
4ABAN012.46	Banister Lake
4AGIB000.66	Gibson Creek
4ATRR001.92	Terrible Creek
4AWNN000.99	Winn Creek

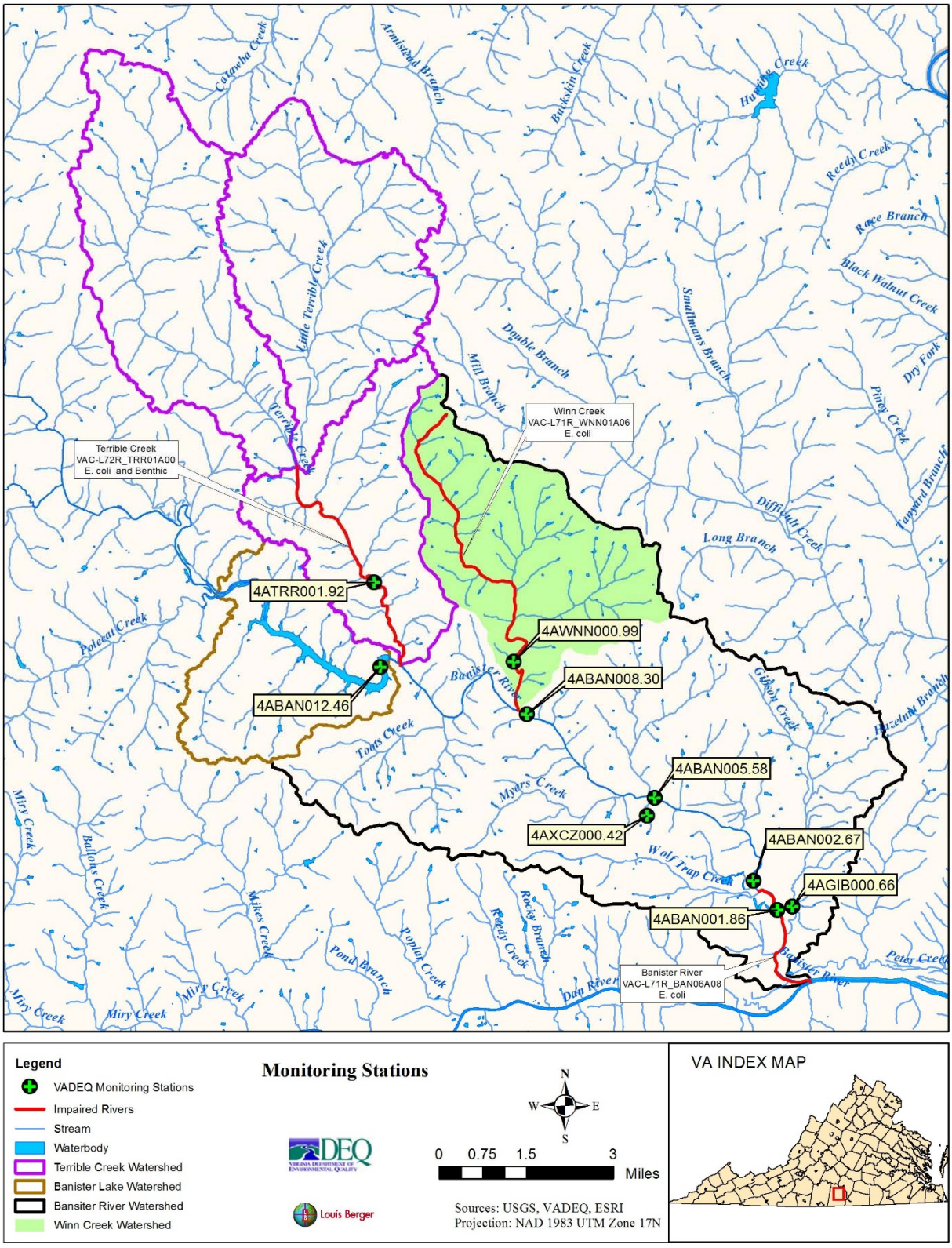

Figure 6-3: Monitoring Station Map for the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP

7.0 Stakeholders' Roles and Responsibilities

Stakeholders are individuals or groups who live or have land management responsibilities in the watershed, including federal, state and local government agencies, businesses, special interest groups, and citizens. Stakeholder participation and support is essential for improving water quality and removing streams from the impaired waters list. The purpose of this chapter is to acknowledge the roles of the stakeholders who worked together to develop the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP and to identify and define the roles and responsibilities many of these stakeholders will also play in the implementation of the control measures described in the TMDL IP.

7.1 Federal Government

U.S. Environmental Protection Agency (EPA): EPA has the responsibility of overseeing the various programs necessary for the success of the CWA. However, administration and enforcement of such programs falls largely to the states. Section 303(d) of the CWA and current EPA regulations do not require the development of TMDL IPs. EPA has outlined nine minimum elements of an approvable TMDL IP for states to receive Section 319 funding for TMDL IP development and implementation.

Natural Resources Conservation Service (NRCS): NRCS, as part of the U.S. Department of Agriculture, works closely with the American people to conserve natural resources on private lands. NRCS assists private landowners with conserving their soil, water, and other natural resources. Local, state and federal agencies and policymakers also rely on the expertise of NRCS staff. NRCS is also a major funding stakeholder for impaired water bodies through the Environmental Quality Incentive Program (EQIP). More information is available at *http://www.nrcs.usda.gov/*.

7.2 State Government

In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. Currently, there are six state agencies that have a major role for regulating and/or overseeing statewide activities that impact water quality in Virginia. These agencies include: Virginia Department of Environmental Quality (VADEQ),

Virginia Department of Conservation and Recreation (VADCR), Virginia Department of Agriculture and Consumer Services (VDACS), Virginia Department of Health (VDH), Virginia Department of Forestry (VDOF), and Virginia Cooperative Extension (VCE). VADEQ and VDH have participated in the TMDL IP development process through meeting attendance, comments and suggestions on various aspects of the plan, and/or through provision of watershed and water quality data.

Virginia Department of Environmental Quality (VADEQ): VADEQ is the lead agency in the TMDL process. The Code of Virginia (62.1-44.19:5) directs VADEQ to develop a list of impaired waters, develop TMDLs for these waters, and develop IPs for the TMDLs. VADEQ administers the TMDL process, including the public participation component, and formally submits the TMDLs and IPs to EPA and the State Water Control Board for approval. VADEQ also provides available grant funding and technical support for TMDL implementation. VADEQ has a role in working with local agency partners to track implementation progress for control measures identified in the TMDL IP. In addition, DEQ regional staff will work with interested partners on grant proposals to generate funds for implementation. VADEQ is also responsible for assessing water quality to determine compliance with water quality standards. VADEQ will continue monitoring water quality in the Banister River, Winn Creek, and Terrible Creek in order to assess water quality and determine when water quality standards are attained and the streams can be removed from Virginia's impaired water list. More information on VADEQ is available at *http://www.deq.virginia.gov/*.

Virginia Department of Conservation and Recreation (VADCR): VADCR administers the Virginia Agricultural Cost Share Program, working closely with Soil and Water Conservation Districts to provide cost share and operating grants needed to deliver this program at the local level and track BMP implementation. In addition, VADCR administers the state's Nutrient Management Program, which provides technical assistance to producers in appropriate manure storage and applications of manure and commercial fertilizer. More information on VADCR water quality programs is available at *http://www.dcr.virginia.gov/soil_and_water/index.shtml*.

Virginia Department of Agriculture and Consumer Services (VDACS): VDACS administers the Agricultural Stewardship Act and with the local soil and water district investigates and reviews

claims that an agricultural producer is causing a water quality problem. Examples include sediment erosion and runoff containing nutrients and pesticides. If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken, which may include civil penalties. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, etc. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures. Although complaint-driven, the Agricultural Stewardship Act is considered a regulatory tool that can support the implementation of conservation practices to address pollutant sources in TMDL impaired watersheds. More information on VDACS is available at *http://www.vdacs.virginia.gov/stewardship/index.shtml*.

Virginia Department of Health (VDH): VDH is responsible for adopting and implementing regulations for onsite wastewater treatment and disposal. VDH has the responsibility of enforcing actions to correct failed septic systems and/or eliminate straight pipes (Sewage Handling and Disposal Regulations, 12 VAC 5-610-10 *et seq.*). Homeowners are required to secure permits for handling and disposal of sewage (e.g., repairing a failing septic system or installing a new treatment system). VDH staff provides technical assistance to homeowners with septic system maintenance, design and installation, and responds to complaints regarding failing septic systems and straight pipes. All of the localities included in this TMDL IP are served by the Southside Health District office located in Boydton, Virginia and the Halifax County Health Department (a branch of the Southside Health District) located in Halifax, Virginia. More information on VDH programs is available at *http://www.vdh.state.va.us/EnvironmentalHealth/Onsite/index.htm*.

Virginia Department of Forestry (VDOF): VDOF water quality inspectors assist loggers and landowners with timber harvest planning and execution and encourage the use of specific voluntary best management practices to keep streams free of silvicultural sediments. If loggers fail to apply necessary BMPs on harvest sites, sediment deposition may occur, and that can lead to civil penalties under the Virginia Silvicultural Water Quality Law (10.1-1181.2). The VDOF has prepared a manual to inform and educate forest landowners and the professional forest community on proper BMPs and technical specifications for installation of these practices in

forested areas *(http://www.dof.virginia.gov/water/index-BMP-Guide.htm)*. VDOF also has a major role in protecting watersheds through riparian forest buffers. Forest buffers provide nutrient uptake and soil stabilization, which can benefit water quality by reducing the amount of pollutants that enter local streams. VDOF administers several cost-share programs including the Reforestation of Timberlands (RT) Program which provides financial assistance to private landowners and the forest industry for pine reforestation. More information on VDOF programs is available at *http://www.dof.virginia.gov/water/index.htm*.

Virginia Cooperative Extension (VCE): VCE is an educational outreach program of Virginia's land grant universities (Virginia Tech and Virginia State University), and a part of the national Cooperative State Research, Education, and Extension Service, an agency of the U.S. Department of Agriculture. VCE is a product of cooperation among local, state, and federal governments in partnership with citizens. VCE offers educational programs and technical resources for topics such as crops, grains, livestock, poultry, dairy, natural resources, and environmental management. VCE has published several publications that deal specifically with TMDLs. More information on these publications and the location of county extension offices is available at *http://www.ext.vt.edu*. The local VCE office in Halifax County has been working to distribute educational materials about proper disposal of pet waste to reduce potential bacteria inputs to streams. Also, the local office is involved in getting more pet waste disposal stations installed in dog walking areas.

7.3 Local Government

Local government groups work closely with state and federal agencies throughout the TMDL process; these groups possess insights about their community that may help to ensure the success of TMDL implementation. These stakeholders have knowledge about a community's priorities, how decisions are made locally, and how the watershed's residents interact. Some local government groups and their roles in the TMDL process are listed below.

Soil and Water Conservation Districts (SWCDs): SWCDs are local units of government responsible for the soil and water conservation work within their boundaries. The districts' role is to increase voluntary conservation practices among farmers, ranchers and other land users. District staff work closely with watershed residents and have valuable knowledge of local

watershed practices. The *Halifax SWCD* participated in the Banister River and Winn Creek TMDL IP development process through meeting attendance, comments and suggestions on agricultural practices included in the plan, and/or provision of watershed data.

Planning District Commissions (PDCs): PDCs were organized to promote the efficient development of the physical, social, and economic resources of the regional district including the environment by assisting and encouraging local governmental agencies to plan for the future. More information on the PDCs located in Virginia is available at *http://www.institute.virginia.edu/vapdc/*. The *Southside Planning District Commission (SPDC)* concentrates mainly on assisting member governments in economic development activities. Some efforts have focused on water quality planning, which is complementary to the TMDL process. Specifically, SPDC is involved in the Regional Indoor Plumbing Rehabilitation Program which provides loans for failing waste disposal systems.

County/Town Government Departments: Town and county government staff work closely with PDCs and state agencies to develop and implement TMDLs. They may also help to promote education and outreach to citizens, businesses and developers to introduce the importance of the TMDL process. Local governments have the ability to enact ordinances that aid in the reduction of water pollutants and support BMP implementation such as requirements for pet waste pickup and septic system maintenance and pump out. Representatives from *Halifax County* and the *Town of Halifax* participated in the TMDL IP development process through meeting attendance, comments and suggestions on various aspects of the plan, and/or provision of watershed, BMP, and water quality data.

7.4 Businesses, Community Groups, and Citizens

While successful implementation depends on stakeholders taking responsibility for their role in the process, the primary role falls on the local groups that are most affected; that is, businesses, community watershed groups, and citizens.

Community Watershed and Conservation Groups: Local watershed and conservation groups offer a meeting place and events for river and land conservation groups to share ideas and coordinate preservation efforts and are also a showcase site for citizen action. These groups also

have valuable knowledge of the local watershed and river habitat that is important to the implementation process. The following organizations have participated in the TMDL IP development process through meeting attendance, comments, and suggestions on various aspects of the plan.

Dan River Basin Association (DRBA) preserves and promotes the natural and cultural resources of the Dan River Basin, including the Banister River, through stewardship, recreation and education. They assist in the creation of parks, trails, and access to local waterways and provide public programs including environmental education and volunteer opportunities. The association is involved with the protection of water quality and citizen stream monitoring. DRBA works with local, regional, state, and national partners on issues and projects to protect the basin. More information is available at *http://www.danriver.org/.*

Citizens and Businesses: The primary role of citizens and businesses within the TMDL and implementation process is involvement and input. This may include participating in public meetings, assisting with public outreach and education, providing input about the local watershed history, and/or implementing best management practices on their property to help restore water quality. Local residents and farmers as well as the following organizations and businesses have participated in the TMDL IP development process through meeting attendance, comments, and suggestions on various aspects of the plan.

Southeast Rural Community Assistance Project, Inc. (SERCAP) is a nonprofit organization founded and based in Roanoke that focuses on improving the quality of life within rural communities. Through training programs, technical assistance, and community action as well as partnerships with federal, state, regional and local agencies and businesses SERCAP primarily addresses water and wastewater needs in rural communities but also assists with community and economic development, housing, and health care.

Tri-County Community Action Agency, Inc. (TCCA) is a community-based, multi-purpose organization providing social and advocacy services to individuals and families throughout Charlotte, Mecklenburg, and Halifax Counties. Services provided include education, housing services including weatherization and repair, emergency food and shelter, financial resources, and other support services.

The *Halifax County Service Authority (HCSA)* is an authority that provides water and wastewater services to Halifax County and surrounding areas. The Authority provided data on sewer distribution and failing septic disposal systems and corrections within the watersheds. More information is available at *http://www.hcsa.us/index.html*.

Community Civic Groups: Community civic groups take on a wide range of community service including environmental projects. Such groups include Ruritan, Farm Clubs, Homeowner Associations and youth organizations such as 4-H and Future Farmers of America. These groups offer a resource to assist in the public participation process, educational outreach, and assisting with implementation activities in local watersheds.

Animal Clubs/Associations: Clubs and associations for various animal groups (e.g., beef, equine, poultry, swine, and canine) provide a resource to assist and promote conservation practices among farmers and other land owners, not only in rural areas, but in urban areas as well, where pet waste has been identified as a source of bacteria in water bodies.

Virginia's approach to correcting nonpoint source pollution problems continues to be encouragement of participation through education and financial incentives; that is, outside of the regulatory framework. If, however, voluntary approaches prove to be ineffective, it is likely that implementation will become less voluntary and more regulatory.

The benefits of involving the public in implementation can be very rewarding, but the process of doing so in an effective manner is often challenging. It is, therefore, the primary responsibility of these stakeholder groups to work with local citizens to encourage public participation and assure broad representation and objectivity throughout the implementation process.

8.0 Integration with Other Watershed Plans

Like most watersheds in Virginia, water quality in the Lower Banister River, Winn Creek, and Terrible Creek watersheds is a component of many different organizations, programs and activities. Such efforts include voluntary and regulatory actions through watershed implementation plans, TMDLs, water quality management, erosion and sediment control regulations, stormwater management programs, source water assessment programs, local comprehensive and strategic plans, and activities by local environmentally-focused organizations. These efforts should be evaluated to determine how they may compliment the implementation goals outlined in this plan and how local efforts can be more effective. Often these efforts are related or collaborative, but this is not always the case. Coordination of local programs can increase participation and prevent redundancy. Initiatives coinciding with the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP efforts include, but are not limited to, those described below.

8.1 Projects and Programs

There are various existing programs, projects, and plans that focus on aspects of the Lower Banister River, Winn Creek, and Terrible Creek watersheds and its natural resources, water quality and quantity, and stormwater. Although this is not a comprehensive list, brief descriptions of some of these are provided below.

Virginia Scenic Rivers Program: In 2013, the Banister River, from the Route 29 bridge to the confluence with the Dan River, was designated a Virginia Scenic River under the Virginia Scenic Rivers Act of 1970 (§10.1-400). This designation encourages preservation and protection of the river and requires state agencies to consider visual, natural, and recreational values of a Scenic River in their planning and permitting processes.

Southern Virginia Wild Blueway: The Southern Virginia Wild Blueway is a water trail running within Halifax and Mecklenburg Counties. The Blueway includes portions of the Banister, Dan, and Staunton (Roanoke) Rivers for over 100 miles of navigable waters. Kerr Lake and Lake Gaston offer over 1,200 miles of shoreline for exploration. River and lake access through the

Blueway facilitates recreational pursuits such as canoeing, kayaking, fishing, and wildlife viewing.

8.2 Other TMDL Implementation Plans

There are two other TMDL IPs within the Banister River watershed. These are *A Plan to Reduce Bacteria Sources in the Upper Banister River and Tributary Watersheds* (VADCR, 2011) and the *Lower Banister River Watershed Implementation Plan* (VADCR, 2012). The approval of the Lower Banister River, Winn Creek, and Terrible Creek TMDL IP would allow for the entire Banister River watershed from its headwaters in Pittsylvania County to its' confluence with the Dan River in Halifax County to be included in a plan for improving water quality and delisting of impaired segments.

8.3 Legal Authority

Septic ordinance creation is a common avenue for compliance with proposed TMDL IP actions; however, the proposed TMDL IP is not prescribing any ordinance creation. Halifax County and the Town of Halifax currently do not have pet waste removal or septic system maintenance ordinances; any actions related to these measures are voluntary. Maintenance of septic systems helps prevent septic system failure and the removal of pet waste on public and/or private property would reduce the amount of bacteria from this source entering local waters.

8.4 Citizen Monitoring

VADEQ supports a program for the voluntary monitoring of state waters by citizen groups. This monitoring can assist in the listing or delisting of impaired waters, TMDL development through source identification, tracking progress of waters with approved TMDLs or TMDL IPs, and identifying waters for potential future VADEQ monitoring. Citizen monitoring also helps to educate the public about water quality in the region and the effect of anthropogenic land uses and activities on water quality. A quality assurance project plan is required before citizens can receive funding for water quality monitoring. State funding allows for development and support of monitoring programs, purchase of equipment, and educational materials. During working group meetings, stakeholders mentioned that the Dan River Basin Association and the Southern Virginia High Educational Center might be interested in citizen monitoring.

9.0 Potential Funding Sources

Potential funding sources available for the implementation of the proposed control measures and practices (Chapter 5.0) were identified during development of this TMDL IP. Funding options vary in applicability to specific watershed conditions, including pollutant sources and land uses, as well as the potential project sponsor(s). A brief description of the programs and their requirements include, but are not limited to, those described below.

9.1 Federal

Federal Clean Water Act Section 319 Incremental Funds – Through Section 319 of the Federal Clean Water Act, Virginia is awarded grant funds to implement TMDLs. Stakeholder organizations can apply, on a competitive basis through a Request for Proposals process administered by VADEQ, for 319 grants to implement BMPs and educational components included in a TMDL IP.

United States Department of Agriculture (USDA) – Farm Service Agency (FSA)

Conservation Reserve Program (CRP) – Through this program, cost-share assistance is available to establish cover of trees or herbaceous vegetation on cropland. Offers for the program are ranked, accepted and processed during fixed signup periods that are announced by FSA. If accepted, contracts are developed for a minimum of 10 years and not more than 15 years. Land must have been owned or operated by the applicant for at least 12 months prior to the close of the signup period. The payment to the participant is up to 50% of the cost for establishing ground cover. Incentive payments for wetlands hydrology restoration equal 25% of the cost of restoration. Information is available at *http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp.*

Conservation Reserve Enhancement Program (CREP) – This program is an "enhancement" of the existing USDA CRP Continuous Sign-up. It has been "enhanced" by increasing the cost-share rates from 50% to 75% and 100%, increasing the rental rates, and offering a flat rate incentive payment to place a permanent "riparian easement" on the enrolled area. Pasture and cropland (as defined by USDA) adjacent to streams, intermittent streams, seeps, springs, ponds

and sinkholes are eligible to be enrolled. Buffers consisting of native, warm-season grasses on cropland, to mixed hardwood trees on pasture, must be established in widths ranging from the minimum of 30% of the floodplain or 35 feet, whichever is greater, to a maximum average of 300 feet. Cost-sharing (75% to 100%) is available to help pay for fencing to exclude livestock from the riparian buffer, watering facilities, hardwood tree planting, filter strip establishment, and wetland restoration. In addition, a 40% incentive payment upon completion is offered and an average rental rate of $70/acre on stream buffer area for 10 to 15 years. The Commonwealth of Virginia will make an additional incentive payment to place a perpetual conservation easement on the enrolled area. Program details are available at *http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=cep* and *http://www.dcr.virginia.gov/soil_and_water/crep.shtml.*

USDA – Natural Resources Conservation Service (NRCS)

Conservation Stewardship Program (CSP) – The CSP is a voluntary program that encourages agricultural and forestry producers to address resource concerns by (1) undertaking additional conservation activities, and (2) improving and maintaining existing conservation systems. CSP provides financial and technical assistance to help land stewards conserve and enhance soil, water, air, and related natural resources on their land. CSP is available to all producers, regardless of operation size or crops produced. Eligible lands include cropland, grassland, prairie land, improved pastureland, rangeland, nonindustrial private forest land, and agricultural land under the jurisdiction of an Indian tribe.

Environmental Quality Incentives Program (EQIP) – This program was established in the 1996 Farm Bill to provide a single voluntary conservation program for farmers and landowners to address significant natural resource needs and objectives. Approximately 65% of the EQIP funding for the state of Virginia is directed toward "Priority Areas." These areas are selected from proposals submitted by a locally led conservation work group. Proposals describe serious and critical environmental needs and concerns of an area or watershed, and the corrective actions they desire to take to address these needs and concerns. The remaining 35% of the funds are directed toward statewide priority concerns of environmental needs. EQIP offers 5-year to 10-year contracts to landowners and farmers to provide 75% cost-share assistance, 25% tax credit,

and/or incentive payments to implement conservation practices and address the priority concerns statewide or in the priority area. Additional information is available at *http://www.nrcs.usda.gov/wps/portal/nrcs/detail/va/programs/financial/eqip/?cid=nrcs142p2_018820.*

Agricultural Lands Easement Program – The 2014 Farm Bill authorized $1 billion in funding for the new Agricultural Lands Easement program, which consolidates the former Farm and Ranch Lands Protection Program (FRPP), Grassland Reserve Program (GRP) and Wetlands Reserve Program (WRP) into a single program. This program will provide grants to purchase conservation easements that permanently restrict development on important farmland and reward landowners who participate in the program with permanent tax breaks.

United States Fish and Wildlife Service (USFWS) – The Fish and Wildlife Service administers a variety of natural resource assistance grants to governmental, public and private organizations, groups and individuals. Natural resource assistance grants are available to state agencies, local governments, conservation organizations, and private individuals.

9.2 State

Virginia Agricultural Best Management Practices (BMPs) Cost-Share Program – The cost-share program is funded with state and federal monies through local Soil and Water Conservation Districts (SWCDs). SWCDs administer the local programs with state oversight through VADCR to encourage farmers and landowners to use BMPs on their land to better control transport of pollutants into waters due to excessive surface flow, erosion, leaching, and inadequate animal waste management. Program participants are recruited by SWCDs based upon those factors, which have a great impact on water quality. Cost-share is typically 75% of the actual cost. Details concerning this program are available at *http://www.dcr.virginia.gov/soil_and_water/costshar.shtml#tools*, and *http://dswcapps.dcr.virginia.gov/htdocs/agbmpman/csmanual.pdf.*

Virginia Agricultural Best Management Practices Loan Program – The purpose of this program is to provide a long term source of low interest financing which will encourage the use of specific BMPs which reduce or eliminate the impact of Agricultural Non-Point Source (NPS)

pollution to Virginia waters. This "Low-Interest Loan Program", as it is sometimes referred, is administered by VADEQ. Additional benefits of the program include the protection of open space or natural values of the properties and/or the assurance of the availability of the land for agricultural, forest, recreation, or open space use. Although these other benefits are of value, the principal focus and utilization of the Fund is to improve water quality in the Commonwealth. Details concerning this program and eligible BMPs are available at:
http://dswcapps.dcr.virginia.gov/htdocs/agbmpman/csmanual.pdf.

Virginia Agricultural Best Management Practices Tax Credit Program – For all taxable years, any individual or corporation engaged in agricultural production for market, who has in place a soil conservation plan approved by the local SWCD, is allowed a credit against the tax imposed by Section 58.1-320 of an amount equaling 25% of the first $70,000 expended for agricultural best management practices by the individual. Any practice approved by the local SWCD Board must be completed within the taxable year in which the credit is claimed. The credit is only allowed for expenditures made by the taxpayer from funds of his/her own sources. The amount of the credit cannot exceed $17,500 or the total amount of the tax imposed by this program (whichever is less) in the year the project was completed. If the amount of the credit exceeds the taxpayer's liability for such taxable year, the excess may be carried over for credit against income taxes in the next five taxable years until the total amount of the tax credit has been taken. It is also approved for use in supplementing the cost of repairs to streamside fencing. Details concerning eligible BMPs and other program details are available at:
http://www.dcr.virginia.gov/soil_and_water/costshar.shtml#tools, and
http://dswcapps.dcr.virginia.gov/htdocs/agbmpman/csmanual.pdf.

Virginia Clean Water Revolving Loan Fund – EPA awards grants to states to capitalize their Clean Water State Revolving Funds (CWSRFs). The states, through the CWSRF, make loans for high-priority water quality activities. As loan recipients make payments back into the fund, money is available for new loans to be issued to other recipients. Eligible projects include point source, nonpoint source and estuary protection projects. Point source projects typically include building wastewater treatment facilities, combined sewer overflow and sanitary sewer overflow correction, urban stormwater control, and water quality aspects of landfill projects. Nonpoint source projects include agricultural, silvicultural, rural, and some urban runoff control; on-site

wastewater disposal systems (septic tanks); land conservation and riparian buffers; leaking underground storage tank remediation, etc. Additional information is available at *http://water.epa.gov/grants_funding/cwsrf/cwsrf_index.cfm.*

Virginia Department of Environmental Quality Citizen Water Monitoring Grant Program – The primary purpose of this program is to provide funding for water quality monitoring groups and individuals to monitor the quality of Virginia's waters. The grant can be used in a variety of ways, including purchasing water quality monitoring equipment, training citizen volunteers, lab analysis costs, and promoting stream monitoring efforts in locations where VADEQ is not currently collecting water quality samples. To be eligible for funding under the regular Citizen Monitoring Grant, a grantee must follow certain guidelines, including developing a quality assurance project plan (QAPP).

Virginia Outdoors Foundation (VOF) – VOF was created by the General Assembly in 1966 to promote the preservation of open-space lands and to encourage private gifts of money, securities, land or other property to preserve the natural, scenic, historic, scientific, open-space and recreational areas of the Commonwealth. The primary way VOF protects land is by holding conservation easements, which are voluntary agreements with landowners that restrict certain types of development on land in perpetuity. VOF also accepts donations of land, which it either protects with an easement and transfers to another landowner, or owns and manages for public benefit.

VOF also administers the Open Space Lands Preservation Trust Fund, which assists landowners with the costs of conveying open-space easements and purchases all or part of the value of easements. Priority for funding is given to applications on family farms and for those with demonstrated financial need. For more information, visit the Preservation Trust Fund page. A gift of a permanent open-space easement may qualify as a charitable gift and be eligible for certain state and federal tax benefits. In addition, there may be local property tax reductions and federal estate tax exemptions. An independent certified appraiser must establish the value of the easement that is primarily based on the value of the development rights forgone. Once that value is established, it becomes the basis for calculating tax benefits. Visit the Tax Benefits section for

more information. (Note: VOF does not give tax advice.) Additional information is available at *http://www.virginiaoutdoorsfoundation.org/.*

Virginia Small Business Environmental Compliance Assistance Loan Fund – The Fund, administered through VADEQ, is used to make loans or to guarantee loans to small businesses for the purchase and installation of environmental pollution control equipment, equipment to implement voluntary pollution prevention measures, or equipment and structures to implement agricultural BMPs. The equipment must be needed by the small business to comply with the federal Clean Air Act, or it will allow the small business to implement voluntary pollution prevention measures. The loans are available in amounts up to $100,000 and will carry an interest rate of 3%, with favorable repayment terms based on the borrower's ability to repay and the useful life of the equipment being purchased or the life of the BMP being implemented. To be eligible for assistance, a business must employ 100 or fewer people and be classified as a small business under the federal Small Business Act. Information is available at *http://www.deq.virginia.gov/portals/0/deq/air/smallbusinessassistance/autobody/appendix13.pdf.*

Virginia Stormwater Local Assistance Fund (SLAF) – SLAF funds stormwater projects including: (1) new stormwater best management practices, (2) stormwater BMP retrofits, (3) stream restoration, (4) low impact development projects, 5) buffer restorations, (6) pond retrofits, and (7) wetlands restoration. Eligible recipients are local governments, meaning any county, city, town, municipal corporation, authority, district, commission, or political subdivision created by the General Assembly or pursuant to the Constitution or laws of the Commonwealth. The fund is administered by VADEQ.

Virginia Water Quality Improvement Fund – This is a permanent, non-reverting fund established by the Commonwealth of Virginia in order to assist local stakeholders in reducing point and nonpoint nutrient loads to surface waters. Eligible recipients include local governments, SWCDs, and individuals. Grants for point sources and nonpoint sources are administered through VADEQ. Most WQIF grants provide matching funds on a 50/50 cost-share basis. Additional information is available at *http://www.deq.virginia.gov/Programs/Water/CleanWaterFinancingAssistance/WaterQualityImprovementFund.aspx.*

Indoor Plumbing Rehabilitation (IPR) Program – The IPR program, which was initiated by the Virginia Department of Housing and Community Development and funded by the Commonwealth of Virginia and the U.S. Department of Housing and Urban Development, is administered by regional sub-recipients, including nonprofit housing providers and housing authorities. The program provides zero percent interest, subsidized loans in eligible localities for the installation of indoor plumbing to owners of substandard housing where indoor plumbing does not exist or where the existing waste water disposal systems have failed. Loan repayments are determined by the homeowner's ability to make payments. The program also provides for the general rehabilitation of these units and for accessibility improvements to units occupied by persons with disabilities or where overcrowded conditions exist. Additional information and eligibility requirements are available at *http://www.dhcd.virginia.gov/index.php/housing-programs-and-assistance/6-indoor-plumbing-rehabiliation-ipr.html.*

9.3 Regional and Private

Community Development Block Grant (CDBG) – The CDBG program is a flexible program that provides communities with resources to address a wide range of unique community development needs. Beginning in 1974, the CDBG program is one of the longest continuously run programs at the United States Department of Housing and Urban Development. The CDBG program provides annual grants on a formula basis to 1209 general units of local government and States.

Over a 1, 2, or 3-year period, as selected by the grantee, not less than 70% of CDBG funds must be used for activities that benefit low- and moderate-income persons. In addition, each activity must meet one of the following national objectives for the program: benefit low- and moderate-income persons, prevention or elimination of slums or blight, or address community development needs having a particular urgency because existing conditions pose a serious and immediate threat to the health or welfare of the community for which other funding is not available. Information on the program, participation, and eligible activities is available at *http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs.*

National Fish and Wildlife Foundation (NFWF) – Grant proposals for this funding are accepted throughout the year and processed during fixed sign up periods. There are two decision cycles per year. Each cycle consists of a pre-proposal evaluation, a full proposal evaluation, and a Board of Directors' decision. Grants generally range between $10,000 and $150,000. Grants are awarded for the purpose of conserving fish, wildlife, plants, and their habitats. Special grant programs are listed and described on the NFWF website *(http://www.nfwf.org)*. If the project does not fall into the criteria of any special grant programs, a proposal may be submitted as a general grant if it falls under the following guidelines: (1) it promotes fish, wildlife and habitat conservation, (2) it involves other conservation and community interests, (3) it leverages available funding, and (4) project outcomes are evaluated.

Five Star and Urban Waters Restoration Grant Program – This NFWF program seeks to develop nation-wide-community stewardship of local natural resources, preserving these resources for future generations and enhancing habitat for local wildlife. Projects seek to address water quality issues in priority watersheds, such as erosion due to unstable streambanks, pollution from stormwater runoff, and degraded shorelines caused by development. The program requires the establishment and/or enhancement of diverse partnerships and an education/outreach component that will help shape and sustain behavior to achieve conservation goals. The Five Star program provides $20,000 to $50,000 grants with an average award size of $25,000. Grants that are in the $30,000 to $50,000 range are typically two years and are in urban areas. Additional information for this program is available at *http://www.nfwf.org/fivestar/Pages/home.aspx.*

Funding priorities for this program include:

- On-the-ground wetland, riparian, in-stream and/or coastal habitat restoration
- Meaningful education and training activities, either through community outreach, participation and/or integration with K-12 environmental curriculum
- Measurable ecological, educational and community benefits
- Partnerships: Five Star projects should engage a diverse group of community partners to achieve ecological and educational outcomes.

Southeast Rural Community Assistance Project (SERCAP) – The mission of this project is to promote, cultivate, and encourage the development of water and wastewater facilities to serve low-income residents at affordable costs and to support other development activities that will improve the quality of life in rural areas. Staff members of other community organizations complement the SERCAP staff across the region. They can provide (at no cost): on-site technical assistance and consultation, operation and maintenance/management assistance, training, education, facilitation, volunteers, and financial assistance. Financial assistance includes $1,500 toward repair, replacement, or installation of a septic system, and $2,000 toward repair, replacement, or installation of an alternative waste treatment system. Funding is only available for families making less than 125% of the federal poverty level. Details about specific loans and funding opportunities are available at *http://www.sercap.org/*.

Virginia Environmental Endowment – The Virginia Environmental Endowment is a nonprofit, independent grant-making foundation whose mission is to improve the quality of the environment by using its capital to encourage all sectors to work together to prevent pollution, conserve natural resources, and promote environmental literacy. Current grant-making priorities in Virginia include improving local rivers and protecting water quality throughout Virginia, Chesapeake Bay restoration, enhancing land conservation and sustainable land use, advancing environmental literacy and public awareness, and supporting emerging issues in environmental protection. Applications are accepted biannually with deadlines of June 15th and December 1st. Guidelines and application information are available at *http://www.vee.org/*.

Wetland and Stream Mitigation Banking – Mitigation banks are sites where aquatic resources such as wetlands, streams and streamside buffers are restored, created, enhanced, or in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources. Mitigation banking is a commercial venture that provides compensation for aquatic resources in financially and environmentally preferable ways. Not every site or property is suitable for mitigation banking. Mitigation banks are required to be protected in perpetuity, to provide financial assurances and long term stewardship. The mitigation banking process is overseen by an Inter-Agency Review Team made up of state and federal agencies and chaired by VADEQ and the U.S. Army Corps of Engineers.

Tri-County Community Action Agency, Inc. (TCCA) – TCCA is a community-based, multi-purpose organization providing social and advocacy services. TCCA, in conjunction with other local partners, provides federal funds and grants for repair of failing septic systems or installation of sewage disposal systems for households with no treatment system through an indoor plumbing and rehabilitation program. TCAA received a 319(h) grant from VADEQ in 2014 to begin working with homeowners with failing septic systems and straight pipes in the Halifax County portion of the Lower Banister River and Sandy Creek watersheds as well as Polecat Creek (solely in Halifax County). This IP area is upstream of the subject IP.

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APPENDIX A – Terrible Creek and Banister Lake Source Assessment

Human Sources – Sewage Disposal Methods

One of the bacteria sources within the watershed is human waste disposal. Disposal methods include sewer systems, septic tanks, and alternative means of disposal, including straight pipes. In order to estimate this source, the number of houses in the watershed was counted using aerial imagery. The 1990 census was the most recent data set publically available that details the sewage disposal methods by county. The 1990 sewage disposal ratios were applied to the number of houses counted in the subwatersheds to get the estimates shown in Table A-1.

Table A-1: Sewage Disposal Estimates for Terrible Creek and Banister Lake Watersheds

Watershed Segment	Total Number of Houses[1]	Number of Houses Public Sewer[2]	Number of Houses on Septic Systems[2]	Number of Houses on "Other Means"[2]	Number of Houses with a Failing Septic System[3]
Terrible Creek 1	223	31	171	21	7
Terrible Creek 2	190	26	146	18	6
Terrible Creek 3	205	28	157	20	6
Banister Lake	435	60	334	42	13

[1] Manual count using aerial imagery
[2] Based upon 1990 census breakdown of sewage disposal
[3] Based on a septic failure rate of 4% (VDH, 2013)

Pets

Another source of bacteria within the watershed is pet waste deposition. Pet waste estimates are based on nationwide pet density estimates of 0.584 dogs per household and 0.638 cats per household[1]. These densities were multiplied by the number of houses counted in each subwatershed to get the estimates presented in Table A-2.

[1] *https://www.avma.org/KB/Resources/Statistics/Pages/Market-research-statistics-US-pet-ownership.aspx*

Table A-2: Pet Population Estimates for Terrible Creek and Banister Lake Watersheds			
Watershed Segment	**Total Number of Houses[1]**	**Dogs**	**Cats**
Terrible Creek 1	223	130	142
Terrible Creek 2	190	111	121
Terrible Creek 3	205	120	131
Banister Lake	435	254	278

Note: For this analysis, house is equal to household.
[1] Manual count using aerial imagery

Agricultural Practices

The TMDL will use the populations of livestock listed in the 2012 USDA Census for Halifax County to determine the number of livestock within the watershed[2]. The ratio of Halifax County pasture area to the Terrible Creek TMDL watershed and the Banister Lake watershed pasture area was used to estimate the livestock populations presented in Table A-3.

Table A-3: Livestock Present in Terrible Creek and Banister Lake Watersheds								
Watershed Segment	**Beef Cows**	**Milk Cows**	**Other Cattle**	**Hogs/ Pigs**	**Sheep and Lambs**	**Chickens**	**Chickens (Layers)**	**Horses**
Terrible Creek 1	147	2	154	118	7	4	222	10
Terrible Creek 2	218	3	229	176	10	5	329	15
Terrible Creek 3	298	4	313	240	14	7	451	20
Banister Lake	99	1	104	80	5	2	150	7

Wildlife

Wildlife is a common contributor to the bacterial loads. In working on many TMDLs, the Virginia Department of Game and Inland Fisheries has developed typical wildlife densities used to estimate populations of wildlife. These densities can vary from region to region. Table A-4 presents the initial densities and habitats used to estimate the wildlife population in the source assessment development. Table A-5 provides the estimated wildlife population in the source assessment.

[2] *http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Virginia/*

Table A-4: Wildlife Densities and Habitat for Terrible Creek and Banister Lake Watersheds			
Wildlife Type	**Habitat**	**TMDL Estimates**	
Deer	Entire watershed except open water, high intensity development	0.04700	per acre
Raccoon	Upland Forest	0.01563	per acre
	Bottomland forest, marsh, swamp, within 600 feet of streams	0.07813	per acre
Muskrat	Medium sized stream intersecting pasture fields	8	per mile
	Pond or lake edge	10	per mile
	Ditch or medium sized stream intersecting agriculture crop fields	16	per mile
	Slow-moving river	50	per mile
Beaver	Stream and rivers	4.8	per mile
Turkey	Forest	0.01000	per acre
Canadian Geese	Urban, residential, grassland, pasture, wetland, scrub/shrub, barren within 300 feet of streams and ponds	0.00825	per acre
Mallards	Urban, residential, grassland, pasture, wetland, scrub/shrub, barren within 300 feet of streams and ponds	0.00062	per acre

Table A-5: Estimated Number of Wildlife per Segment							
Watershed Segment	**Deer**	**Raccoon**	**Muskrat**	**Beaver**	**Wild Turkey**	**Canadian Geese**	**Ducks**
Terrible Creek 1	292	282	45	39	38	195	163
Terrible Creek 2	427	420	60	55	57	272	227
Terrible Creek 3	449	380	73	52	53	271	226
Banister Lake	249	258	141	18	39	154	128

Appendix B – Steering Committee and Working Group Meeting Minutes and Summaries

Table B-1 lists the date and type of each meeting. Minutes and notes from the meetings are included below.

Table B-1: Meetings during Development of the Lower Banister River, Winn Creek, and Terrible Creek TMDL Implementation Plan

Date	Meeting Type
04/17/2014	Public Meeting #1 & Agricultural/Residential Working Groups #1
05/15/2014	Government Working Group #1
08/13/2014	Agricultural/Residential Working Groups #2
10/14/2015	Steering Committee Meeting #1
10/27/2015	Public Meeting #2

Banister River and Winn Creek TMDL IP

First Public Meeting & Agricultural/Residential Working Group Meeting
April 17, 2014
7:00pm, Mary Bethune Office Complex, Halifax, Virginia

Attendees

- Rick Brown, Halifax SWCD
- Bill Coleman, Tri-County Community Action Agency
- Chris Flannagan, Louis Berger
- Diana Hackenburg, VADEQ
- Erin Hagan, Louis Berger
- Paula Nash, VADEQ
- Charlie Lunsford, VADEQ
- Justin Smith, Resident
- Nick Tatalovich, Louis Berger
- Curtis Arrington, VDH
- Linda Reed, Resident

Introduction

Tonight's meeting is about an Implementation Plan for the Banister River and Winn Creek. Once this plan is finished, the entire Banister River from its headwaters in Pittsylvania County to its confluence with the Dan River will have Implementation Plans. One grant-funded implementation project is starting soon on the Lower Banister. Back in 2007, Louis Berger created TMDLs for the Upper Banister in Pittsylvania County, including the Banister River mainstem. A couple of years later, DCR worked on an Implementation Plan for that section in Pittsylvania County. The Lower Banister was saved for later to reduce travel for stakeholders interested in the sections of the river in Halifax County. In 2010, the lowest sections of the Banister near Banister Lake were found to be impaired and a TMDL was completed for those sections in May 2013.

Presentation by Louis Berger – TMDL IP process and overview, TMDL review, Public participation overview, IP development timeline

General Questions

- *How do I get involved in the working groups?* Tonight is the first public meeting and working group meeting. By putting your name on the list, you will get correspondence about the project, including further meeting notices. Please invite any other interested stakeholders to join in the process.
- *Why do most of the monitoring samples appear below the water quality standard line for bacteria?* Samples are analyzed within different time periods and the water quality standard is based on a total violation rate. These points are snapshots in time and looking at them together provides a clearer picture of the water quality on average.

- *Is the only pollutant of concern right now bacteria?* What about mercury or nitrogen? Correct. There is not much biological monitoring in the watershed currently. There may be a mercury impairment. Many of the actions that will be outlined in this plan will also help improve water quality by reducing other potential pollutants. The focus will be bacteria, but other benefits will be associated with each action described in the plan.

Septic Systems and Straight Pipes

- *How to address septic issues and straight pipes?* There is a need for funding to help people with insufficient waste systems. Most of the time when people have failing septic systems, they come to the Health Department because their neighbors report them. Curtis (VDH) has never run across a privy. Most of the privies were at houses that have fallen down or do not have electricity. You may run across an old one every once in a while, but they are rarely in use. In NC, there is an approved way to construct a privy, but it's generally cost-prohibitive. In VA, can be used in very rural situations, but not if there are full-time residents. The Corps can use privy, but those cannot be open to the public. They also need to have a service contract to get a permit.
- Curtis (VDH) has not run across maybe more than 5 straight pipes in 25 years. Charlie commented that many antiquated systems at older homes close to a stream may run to the stream even though they might not pipe directly into the stream.
- Will need sewer overlay from Halifax to see if any homes on septic systems can be connected to sewer.
- In the county, if septic systems fail and sewer is available, they must connect to public sewer. There is no distance criterion, but sewer line must be easily accessible.
- PSA here is called Halifax County Services.
- The local VDH office does not keep a list of reported failing septic systems. If a situation is reported, they are given a timeframe to fix the problem and it must be fixed.
- Tri-County Community Action Agency (TCCA) is trying to leverage community funds as part of an indoor plumbing program to help homeowners. SERCAP in Roanoke also has small grants available to help homeowners with septic repairs statewide. TCCA is leading an implementation project for the Lower Banister, Polecat Creek and Sandy River. They are moving to a regional approach for this funding. Telamon, another human services nonprofit working in the region, opted out of the regional indoor plumbing program.
- Part of the problem is getting the word out about programs that can help pay for septic repairs. Stakeholders agreed that there is a need for education on septic system operation and maintenance in the watershed. It is easy to ignore systems when there is no problem. The public perception of what will happen to them if they report the problem and ask for help is also a deterrent to participation in these programs. Need to do a better job of educating people about the costs of system maintenance and replacement as well as how much it may directly cost the landowners once implementation efforts are in place.
- The only real maintenance for conventional systems is regular pump-outs which are required by some counties. If the homeowner doesn't do the pump-out, the county will do it and add it to the homeowner's tax bill. Not sure who tracks that program, but possible the applicable county treasurer's office. Pump-outs may be included in IP for potential

cost-share funding, stakeholders will need to decide how to approach the number of pump-outs to include in the IP.
- TCCAA will be doing more outreach to homeowners in general about beneficial programs.
- Alternative Waste Treatment systems are an option, but they are required to have yearly inspections and a maintenance agreement. They are also more costly to the homeowner. There are not many in Halifax because the tracts of land are generally big enough for traditional systems.

Pet Waste

- Usually, pet waste issues are addressed in the IP by identifying locations for pet waste stations and by including funding for an educational campaign. Now promoting the idea of including in the plan pet waste digesters/composters for people with small yards.
- The Cooperative Extension Service (Bill McCaleb) is working on a pet waste educational program for the Polecat, Sandy, and Banister and could be a good partner.

Agriculture

- H&H cattle is a livestock market in the watershed. They do sales twice a week and usually haul out livestock the same day. Not sure what they do with manure.
- No CAFOs in the watersheds. Runoff from pastureland grazing was identified in the TMDL and by stakeholders as a large source. No WP-4s needed.
- Halifax is probably one of the counties in the state with the highest use of the CREP program. Probably not much more could be done with CREP. CREP funding was renewed.
- For livestock exclusion, different setbacks are included because farmers often complain that they would be giving up too much of their pasture. Seldom around here is the reduced setback used because most streams here have some type of buffer.
- Virginia is currently offering guaranteed, 100% cost-share for producers who sign up by June 2015 for livestock exclusion systems.
- SWCD does not fence out “sky ponds” but will fence out spring-fed ponds or those with defined drainage. Ponds must present a potential water quality concern.
- Sometimes IPs look at land use conversions such as erodible pasture to trees. People in this watershed are probably not interested in these practices because it increases taxes based on the differences in tax rates on agricultural and forested land.
- Cattle numbers in this watershed is probably going up and the biggest concern is probably overgrazing. EQIP is probably only done by the “best of the best.” An example of that is Mike McDoel (sp?). Cultural changes would probably need to be made to promote pasture management practices.
- Best ways to reach agricultural community here is probably word of mouth between farmers and seeing examples of people doing a good job.

- Horse population probably not increasing in the watershed. A small part of the Amish population may be in this watershed around the northern part of the Banister watershed (not Winn Creek) and they would have horses.
- SWCD does a fair amount of SL-11 on pasture.
- Probably a lot of pasture land that intersects intermittent streams that wouldn't be captured in current mapping and estimation efforts. Majority of SL-6 practices they currently do are on small streams. May need to increase stream exclusion length needed.
- Will this plan impact new construction permitting rules? E&S and Stormwater programs exempt single family housing units. This plan would not have any impact on those rules.
- Army Corps owns about 1,000 acres that would not be available for any practices. This needs to be mapped.

Government Working Group meeting will be held during the day sometime in May. Next working group meetings will also be arranged for sometime in July. An earlier starting time like 6:30pm might work better for those meetings.

Banister River and Winn Creek TMDL Implementation Plan

Government Working Group Meeting

May 15, 2014

Virginia Cooperative Extension Office, 171 South Main Street, Halifax VA

Attendees: Raymond Cocke, NRCS
Daniel Richardson, VDH
Curtis Arrington, VDH
Bill Coleman, Tri-County Community Action
Robert Love, Halifax County
Paula Nash, VADEQ
Charlie Lunsford, VADEQ

Introduction of the Banister/Winn IP. The entire Banister River will be under an IP after this plan is completed. Beneficial for the Banister River and the two localities as far as funding sources are concerned.

Abbreviations: Q – question; A – answer; C – comment; S - statement

Q: Are there any residence that are on septic systems that has the potential to tie into public sewer? If so, we would like to quantify this.
A: Get LB to contact him

Q: Straight pipes. Contractors look at census data. If citizen checks "other", the contractor assumes these are straight pipes. Curtis at public meeting said VDH does not see that many in Halifax County.
A: Per Dan, they find 1-2/year. They surveyed in the Banister/Polecat /Sandy IP area and they found a couple pit privies, but no straight pipes. The TMDL is for bacteria, but there is no source tracking for where it is coming from. No BST testing.

If citizen monitoring is done, we could track where the bacteria is coming from, not necessarily what the source is.

Q: To VDH- Can you help with deciding how many of the failing septic systems, need repairing, new installations, and alternative waste treatment?
A: If a house is built prior to 1981-1982, you may be able to re-level a distribution box, but this will not solve the problem. You may get a couple more years out of the system, but ultimately it may need to be replaced. Use the same failure rates and percentages for repairs, replacements, and alternative waste treatment systems as was used in the Lower Banister IP.

Most of the systems would be repaired as opposed to replaced. IP goals will be provided for Banister River and Winn Creek separately.

Q: NRCS asked why the middle portion of the Banister is not impaired?
A: VADEQ explained the monitoring process

Raymond Cocke (NRCS) discussed the issue of the backflow from the Dan River at 4ABAN001.86. He mentioned that the middle section was not impaired and that this could be a water system issue. Raymond also talked about the fact that the land is swampy. It was also discussed that the Corps of Engineer owes most of the land in this area of the Banister River at the lower station. Water becomes stagnant in this area.

Q: Is there potential for reductions in Wolftrap or Gibson subwatersheds.
A: NRCS feels there would be more in Gibson

S: DCR set up a project with Halifax SWCD in 2013, Southern Rivers Initiative to fund stream exclusion fencing. Would like to find out from Halifax SWCD if this was positive? NRCS thinks all the money has been used.

S: DCR is offering 100% cost share for stream exclusion until June 2015. Currently there is $ 9 million of sign-up that doesn't yet have obligated state funding. There was discussion of people waiting for an increase in the money incentive.

Q: Are there any other septic issues that need to be shared?
A: 4-5% of septic systems will fail per year. Systems that are 30 years old may have a longer life. We use 4% total.

Q: Tri-County Community Action grant project for septics in the existing Banister IP area, do you think Tri-County would be interested in continuing their help in this IP?
A: Depends on the number of systems. They are concentrating on the education. As far as the technical part, they need to work with other partners to help with that, VDH. How many people are we talking about and how many people need help?
C: There will be synergy from the Lower Banister that will funnel into this new IP area. If you receive such contacts, Tri-County will be aware and be able to direct people to the fact that having an IP in the Banister/Winn should be able to provide additional help in the future. Tri-County is working with Diana Hackenburg.

Q: We received good support from the county on the earlier IP in Halifax, what does the Board of Supervisors think of the IP process?

A: County board funding is going to be few and far between. County Administrator wants to be informed, but there is no money. They will provide meeting space, will work with the Town, will work with partners. County owns boat landing. Could work with the Town and could place pet waste pick-up station at that location. Maybe put on any other lands that the county has.
C: If we could identify some places to place these pet pick-up facilities, it would be good to put in the plan.
C: There is talk about a dog park near the park.
C: Southern VA Blueways- Marketing for canoeing and kayaking, flows all the way to Kerr Reservoir, Project with tourism of Halifax and Mecklenburg. Rails to trails, there is a problem with horse manure. Prizery and Berry Hill area. There is a campaign to come up with a plan to pick up the horse manure.
C: There are also problems with horse manure on public roads.
A: County is scaling back, but they are all in for community support. Halifax County opted out of stormwater. They are going to wait until the state comes up with training and certification before they decide whether they want to administer for the county. DEQ will do the stormwater program. County will do E&S plans.

Q: Funding: Core list of funding sources-EQIP, CREP (really has dropped in the last couple years, 1-2 county wide, per NRCS). We will put a low percent of CREP funded fencing practices in the plan (Charlie)
C: Based on Rick Brown's comments, Halifax SWCD, at the public meeting we don't need to worry about manure storage or spreading of stored manure on pasture. Basically, we need stream exclusion fencing and pasture management. There is an educational piece that needs work for pasture and rotational grazing practices.

Q: Do we need to talk about people who buy land and decide to start raising animals?
A: NRCS- generally only helps people after agricultural production is underway. People put in a boundary fence and then run the cattle on the land, cattle have access to streams and overgraze because there are too many animals per acre and NRCS then can cost-share on conservation practices. This is a trend for the last ten years in Halifax. Goats eat all the vegetation down and the rain runs off, high concentrations.

Q: Any other projects in NRCS. Farm bill has absorbed some programs. CRP available, but don't know how much money will be available. CREP, numbers have gotten small in last five years.

Q: 319, administered by VADEQ.
Water Quality Improvement Fund (VADEQ), funds issued through RFP for Non-point source pollution, stormwater, Ag, and on-site sewage disposal. Managed by Walter Gill.

Q: If there are any planned projects to reduce bacteria loadings in the IP area, any of these can be referenced in this plan. Some grants have a small window to receive applications in the application process.

C: There have been some private monies available for some IP.

Q: Southern Virginia Wild BlueWay-Marketing effort to market Dan River, Staunton River, and Banister River….non-motorized boats.

Strippers and White Bass Discussion….If some of the deposition would change in Banister then this may get more people to use the resource.

Banister River has received scenic River designation. Carl Espy can give the actual dates. Language is in the Integration section of the Lower Banister River IP. This was included in the Lower Banister River.

Q: Any other local initiatives? No

Q: Regulatory Controls? Address existing controls that may help the reduction of bacteria. Reference Ag Stewardship Act, Sewage Handling Regulation, Pick up Pet Waste in Town only ordinance, E&S Ordinance. Could cut and paste the VDH from the Lower Banister. Do we quantify a number of alternative waste treatment systems? This would be necessary in the event that funding becomes available from a grant, alternative systems needs to be in the plan.

Q: Monitoring: We talked about the monitoring that was done to list the streams as impaired. What progress are we making on the stream after these BMPS are installed?
A: Paula discussed the monitoring strategy.
Charlie suggested Dan River Basin Association (DRBA) may be a candidate for citizen monitoring.
A 319 project is starting in the Mayo River, in Patrick County and DRBA is a partner in this project to do citizen monitoring. VADEQ can have a discussion with DRBA to see if they would like to participate in the IP.
C: Concern over citizen monitoring and accepting a non-certified lab doing lab work to track progress of BMP.
C: Next Step: Another meeting of the working groups, before this meeting we need LB to give us some refined numbers. We will get these numbers to everyone and let them review. This meeting will be in July….

Southern VA High Educational Center- Earl McDaniel Danville Community College (May be willing to work with Citizen Monitoring)

Monitoring- Envirothon or ecology club….Science teachers at high School

Banister River and Winn Creek TMDL IP
Banister/Winn Creek Agricultural and Residential Working Group Meeting
August 13, 2014
6:00-8:00 pm, Mary Bethune Complex in Halifax, Virginia

- Overview of previous meetings

- Army Corps of Engineers owns 10% of the watershed, ~ 3,000 acres, forested and wetlands. No Ag in this area. The fields are maintained for wildlife. Not many roads or recreational areas.

- Per Carl Espy: On 360 At Terry's Bridge, part of the Blue Way, limited parking

- On 713 Wolftrap Road, VDOT will be replacing the bridge. MOU with the Corps to have a pull-off to launch into the river. No discussion of bathrooms at present.

- Include wildlife management area on watershed map.

- Are there any residents in the Town who could connect to the sewer? Mark Estes will provide a layer within the next couple weeks. Use the failure rates from the Upper/Lower Banister IPs, 4% failure rate. Also, use the ratio for repair and replacements of septic systems from these same IPs.

- Residential partner is Tri-County. M. Coleman said he needed to look at those numbers.

- Equestrian trails need to be on radar.

- Need to update the scenic river designation as of July 1, 2014. 63.33 miles, most navigable portion of the river is US 29 in Pittsylvania County to confluence of Dan River.

- Check with Diana Hackenburg to see if she has heard anything about citizen monitoring.

- There is concern about 10% of the dwellings to receive pump-outs. Maybe we need to increase this number. Louis Berger is to check the Upper/Lower Banister to see what % of pump-outs were included.

- There are 3 locations in the Town of Halifax with pet waste stations. Town has a scoop the poop campaign. These have been in place 3 years. How many bags are used in these stations? Grants will be written for maintenance, i.e. refilling stations. Carl Espy is going to provide the number of bags that have been ordered.

- County is opting out of the stormwater program. These practices need to be vetted through the county. Bacteria in stormwater is coming from pets, failing septic systems and wildlife.

- It was suggested to work with the Garden Club. Cooperative Extension Service to get partnerships to establish rain gardens, bioretention. Cost is prohibitive for the actual amount of bacteria that is coming from stormwater.

- Targets and more realistic: Low Density Residential -rain gardens and riparian buffers. High Density Residential - Bioretention

- Agricultural BMPs came from DCR database, EQIP information was not included in the summary.

- Prioritize watersheds in the IP for BMP implementation.

- Through discussions with SWCD, there is no manure being applied, therefore no cropland BMPs needed.

- Winn Creek can have a different timeline than Banister River. Maybe the phases for Winn Creek would be 6-7 years as opposed to Banister's 10 years, they are two distinct watersheds with different BMP numbers and costs.

- Carl Espy will update the Banister Gateway project information. Blueway-Bi-County initiative between Mecklenburg and Halifax. There could be more stakeholders.

- September 13-Banister River event is planned. The week before will be the river clean-up (September 6)

- A flyer to give out at the final public meeting has been planned.

- Doodle Poll to come up with dates for the meetings, information at the Farmers Market.

- Nick Tatalovich asked for any BMPs that may have been added to the watershed within the last couple years.

- Charlie Lunsford asked about pictures of the watershed.

Lower Banister River, Winn Creek and Terrible Creek TMDL Implementation Plan
Steering Committee Meeting
October 14, 2015
Virginia Cooperative Extension Office, Halifax, VA

Attendees:
Charlie Lunsford, VADEQ
Nick Tatalovich, Louis Berger
Erin Hagan, Louis Berger
Dan Richardson, VDH
Raymond Cocke, USDA NRCS
Rick Brown, Halifax SWCD
Paula Nash, VADEQ
James Moneymaker, VADEQ
Bill McCaleb, VCE

Nick Tatalovich and Charlie Lunsford gave an overview of the implementation process and how the project has come to include Banister Lake. Although Banister Lake is not impaired, two prior Implementation Plans (IP) did not include Banister Lake. Banister Lake will now be included making it available for potential grant funding. Banister Lake is a contributor to downstream water quality.

Nick Tatalovich gave an overview of the watershed and proposed best management practices. The Steering Committee recommended changes to the watershed map to make it easier to read. Proposed changes include: more clearly defining the watersheds, include road and town boundaries.

Regarding the "E. coli – Existing Annual Load Distribution", the committee recommended combining urban source categories as listed. The reductions listed are the reductions required to meet VADEQ water quality standards. Wildlife is listed; however, no wildlife reductions will occur unless there is a nuisance wildlife problem. This is difficult to explain in a public setting. What can we do different?

Water quality is better in the Terrible Creek watershed. Fewer reductions are needed within the Terrible Creek watershed to meet water quality standards.

Comments:

- Nick used GIS to look at pastureland based on land use and location of streams to see what areas may be in need of livestock stream exclusion.

- Town of Halifax maintains pet waste stations within town limits. The committee discussed potential locations for new pet waste stations and provided suggestions to make the associated map easier to read. Signage is important.

- Master Gardeners in Halifax work with homeowners to install rain gardens.
- Halifax SWCD may be interested in the future in applying for a 319 grant.
- Perhaps remove IP targeting from the public meeting. This type of information is more useful for the district to use for outreach.
- Committee discussed stakeholder roles and responsibilities and which entities should be included or not. The committee would like to see landowners added to the list of stakeholders as landowner participation is invaluable.
- Include a next steps slide to inform the public of when the public comment period is, etc.
- Perhaps ask William Coleman to come and speak about current work on the Lower Banister, Sandy Creek, Polecat Creek.
- Ask a local citizen to speak at the start of the meeting. Carl Espy, Halifax Town Manager, was suggested.

Steering Committee Comment Period: October 14-22nd

Lower Banister River, Winn Creek, and Terrible Creek TMDL Implementation Plan
October 27, 2015
Public Meeting #2 (Final)
Mary Bethune Office Complex
Halifax, VA

Carl Espy, Town of Halifax Town Manager, began the meeting at 6:33 and welcomed guests. There were 12 participants total in attendance. Mr. Espy announced additional Banister River segments having received Scenic River designation and attributed that to the wonderful partnerships agencies have with landowners and other stakeholders. Nick Tatalovich began by discussing the three separate Banister River TMDL Implementation Plan (IP) watersheds. Completion of the Implementation Plan discussed tonight will have all of Banister River under an IP.

The Lower Banister River watershed is located within the borders of Halifax County and the Town of Halifax. Major land uses include pasture and forest. Once pollutant sources are determined VADEQ must then determine the reductions needed to meet water quality standards which are done by completing a TMDL Implementation Plan. Nick then discussed the IP process and examples of BMPs that can be installed to reduce E. coli. Measurable goals and milestones are developed during this process.

Nick discussed proposed Best Management Practices including: agricultural, residential, stormwater and pet waste. Technical Assistance will be necessary to ensure implementation of proposed BMPs. Having a completed and approved IP will deem the watershed eligible for grant funding. An Implementation Project is already underway for one of the previously completed IP watersheds. Meeting participants were reminded that implementation plans are not meant to be universally prescriptive even though they identify the BMP types and numbers to be implemented on land uses in the impaired watersheds. Local factors (site conditions, acceptance, needs, cost, maintenance, funding, etc.) will determine the placement of the various BMPs.

Nick discussed Implementation Staging over a 10 year period. BMPs that get the largest bacteria reductions for the least cost are included within the first stage.

Once BMP installation has occurred for two years VADEQ will follow-up with IP monitoring.

Charlie Lunsford discussed stakeholder roles and responsibilities. Success requires involvement from all parties. Clean water can certainly increase recreational usage which can have a positive economic impact.

Charlie discussed the IP schedule and provided contact information for VADEQ and Louis Berger staff.

Questions:

No questions were asked at this time. Handouts and additional reading materials were offered.